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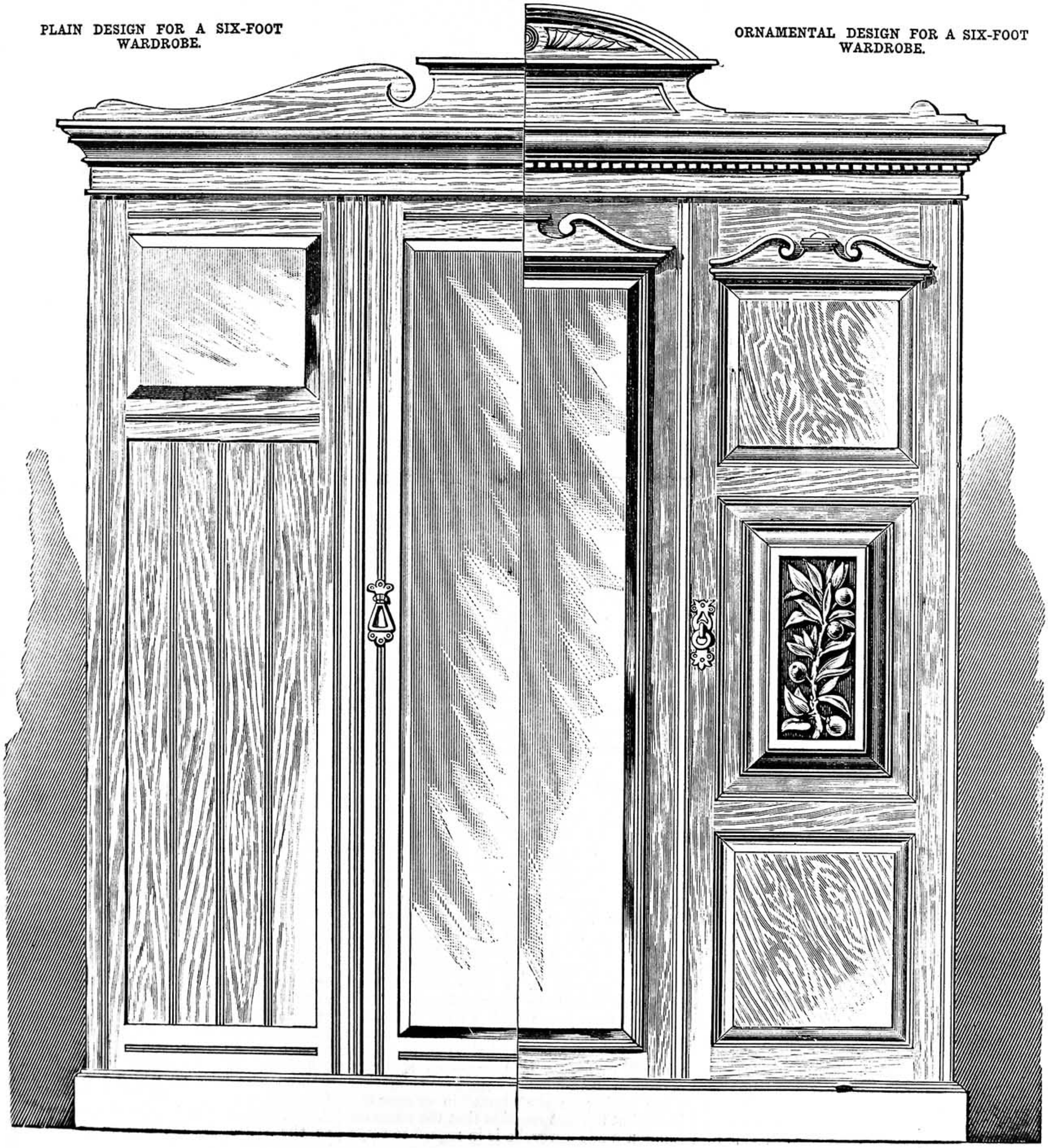
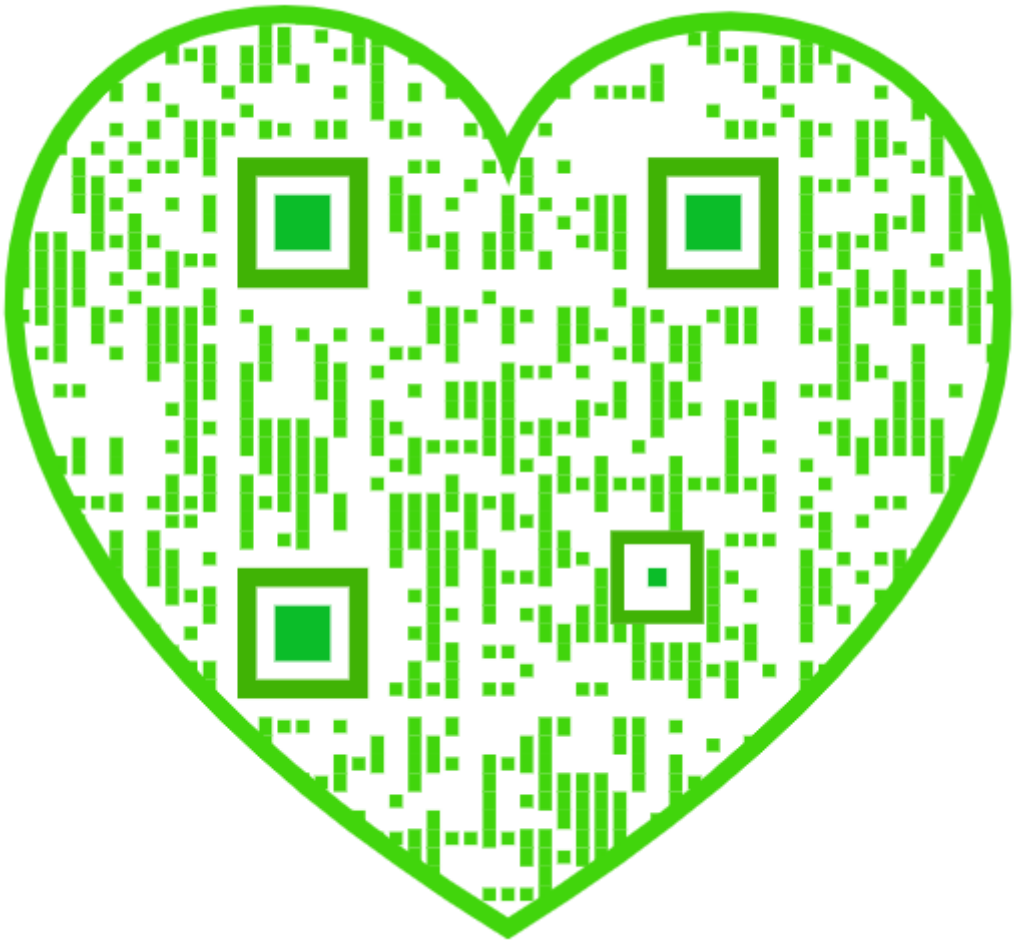
PLAIN DESIGN FOR A SIX-FOOT WARDROBE.

ORNAMENTAL DESIGN FOR A SIX-FOOT WARDROBE.





HOW TO MAKE A SIX-FOOT WARDROBE.

BY AN OLD HAND.

INTRODUCTORY — SIZE — SIZE OF ENDS — PARTS FORMING WARDROBE, DRAWERS, TRAYS— HANGING PART—BONNET BOX AND DRAWER— HOOKS—SHELF—LINING—PLINTH—CORNICE— DOORS—SHORT TRAYS AND DRAWERS.

THE construction of a large wardrobe is a job not to be undertaken by the novice; therefore the following suggestions are offered more for the consideration of the expert workman, who, while thoroughly proficient in the manipulative part of joinery, is not altogether at home in making up articles of furniture, than for those who do not understand the use of tools and the necessary joints. The amateur and the beginner are warned that the following remarks will require reading between the lines if they are to be of any benefit, for I do not so much wish to write detailed directions as to endeavour to represent what may be regarded more in the light of a friendly workshop chat over the bench between two experts in joinery, one of whom may never have had his attention directed to wardrobes. But perhaps one of the good old school of artisan —or shall I not rather call him a tool-using labourer?—who objects to the new-fashioned notions of letting people know so much in "these 'ere papers" may repudiate the notion that a quill-driving creature can tell the practical man anything worth knowing. We all of us know such types of individual, unpleasant to work with, and not, as a rule, quite so clever as he assumes to be. Well, I do not address my observations to him, and only make them in the hope that they may be useful to some of those younger members of my trade—that of a cabinet-maker—who do not object to learn. Everyone of them will know that to say everything that might be told about a 6 ft. wardrobe would take a long time, and I can barely touch the general outlines. For instance, I shall assume that the reader knows how to set out work, make doors and drawers, and the manipulation of the tools required, so that nothing need be said about such details.

Although the size of the wardrobe has been stated in the heading of this article to be 6 ft., there is no reason why a similar article of furniture should not be made either much smaller, or, on the contrary, much larger. The width stated is, however, a good standard or average one, and when a "three-door, long-tray wardrobe" is mentioned, the size that most of those in the furniture trade will conclude it to be is that named. As limits for wardrobes of this construction, 5 ft. and 8 ft. for the smaller and larger may be given; but probably more of them are made 6 ft. wide or thereabouts than of all the other possible measurements put together.

The height of such a wardrobe, whatever the internal fittings may be, will to some extent depend on circumstances, and the following considerations may be some guide to the maker:—That of cost must not be omitted, for, unfortunately for the turning out of really good articles of furniture, it is of prime importance, and "cheeseparing" must be practised sometimes both in work and material if a job is to pay. Now, a wardrobe is a big thing and swallows up some stuff, so that it may be necessary to reduce the quantity as much as possible, not only by keeping the height down, but also the depth from back to front. Why, by this means 4 ft. of stuff can be saved in the ends alone by having them 6 ft. 6 in. by 1 ft. 6 in. instead of 7 ft. by 2 ft. As there are four ends—two inner and two outer—and it may fairly be assumed that these latter are solid, here is a possible saving at once. True, rather extreme measurements have been taken for the ends, but neither of them would be regarded as unsuitable. Increased height adds importance to the work, but it should be remembered that, if it is excessive, convenience may be sacrificed to appearance, for the most convenient wardrobe is undoubtedly that in which most of the contents can be got at without mounting on a chair or steps.

For a 6 ft. wardrobe, a good ordinary size for the ends may be stated as about 6 ft. by 1 ft. 8 in. With a cornice 6 in. deep, or a little more, and a 5 in. plinth, we thus get the total height over all, exclusive of pediment, of about 7 ft. A reduction of 6 in. would make the wardrobe a low one, while, to use the language of our friends of the hammer and rostrum, an addition to the same extent would make the article "noble and massive." The size having been determined on, something will have to be said about the construction, which is by no means difficult to those who can handle their materials. Now, as I have suggested, this—or, indeed, any other form of three-door wardrobe—may be fitted up in what is probably the most popular form of arrangement among buyers, viz., that with sliding trays and drawers extending across two-thirds of the width, and the remaining third being a hanging cupboard.

So far as cabinet work is concerned, there might be no difficulty in making the wardrobe in one piece, but as it would then be inconveniently large and very difficult to remove or get into many ordinary rooms, it is generally—I may say invariably—made in parts. The three-door wardrobe with long trays and drawers is therefore nothing but a collection of parts fitted to, and to a certain extent independent of, each other. For all practical purposes it may be considered that such a piece of furniture consists of five parts—viz., the three principal portions of the carcase, the plinth, and the cornice. Of course, in addition to these are doors, drawers, and trays.

Two-thirds of the wardrobe being occupied with the latter, were one case made to hold them both, the size would be inconveniently great. This two-thirds, or, to put it in other words, the part which is enclosed by two of the doors, is therefore made in two portions, the lower one containing drawers and the upper the sliding trays. The former is nothing but a perfectly plain chest of drawers, while the latter is even simpler, as the trays simply slide either on slips fastened on to the ends of the case, or, better, by means of slips fastened on the ends of the trays and fitting into corresponding grooves in the case. May I here suggest, for the benefit of any "Curtain Road" furniture maker—or rather, dealer—who may see these lines, that good cabinet-makers in "the country" do not altogether appreciate the extremely shallow trays which London trade makers put in. I have known more than once these to be taken out and replaced by good deep trays such as are generally supplied in Scotch wardrobes. Yes, I know all about the reasons for shallow trays—price and all that sort of thing—and that the makers would not get any extra consideration when selling on the "buzz" in or near the Road, but the fact remains that the common London-made wardrobe is in regard to trays not of the best, and I suppose it is within the province of WORK to give a few hints even to metropolitan readers. I do sometimes think that we in the country—by which I mean the cockney's definition—can often give them hints as well as receive them.

The parts containing the drawers and trays must fit together accurately, and are secured to each other when the wardrobe is made up by screws. Only one end need be solid, for the other, as well as the two tops, are not seen, and may be (as they generally are) of pine.

The hanging part is merely a plain cupboard behind the third door, and may be of pine except the outer end. The inner end of it and of the other two portions are, when fitting up, screwed together.

The fittings inside the hanging cupboard vary, but are usually of a very simple character, and it will be sufficient just to indicate arrangements that are often adopted.

Where ladies are concerned—and they generally are in connection with wardrobes—the bonnet box or drawer is usually considered indispensable. The bonnet box which will no doubt occur to most readers as being commonly seen is the familiar and not indestructible bandbox; but, as behoves the cabinet-maker, he must make something more substantial—in fact, he must make something to contain bandboxes. For this purpose the "bonnet box" or drawer of a wardrobe is usually made sufficiently deep to hold several of the others; and, indeed, I do not remember of any lady having ever complained of one being too deep. If it is made to hold two layers of bandboxes, there will not be any complaint on that score; but if made much deeper, the hanging space might be inconveniently diminished thereby.

When a plain drawer is made, there will be no difficulty in its construction, but on several accounts a drawer is not so convenient as a box. This is hardly more than a trade term, for in a strict sense the receptacle is not a box. In one form—and that perhaps the simplest as well as the most convenient—the top is a fixture or shelf enclosed below, with a fall-down front or door hinged at the bottom, and secured at the top with a spring catch.

A very similar construction is that in which the front is fastened and the shelf or lid is hinged near the back. In this case, things which may be on the shelf have to be removed before access can be gained to the interior of the box.

Another form of construction, and one entailing more work, is to make the top in the form of a sliding tray, which must be drawn out to get at the inside of the box.

It is entirely a matter of fancy on the user's part which is the best form to adopt, and, so far as the maker is concerned, a question of cost and which he thinks will suit his customers best.

Leaving the lower portion of the cupboard, let us turn to the top. Hooks here are regarded as indispensable. They are usually fixed in a row on the back and both ends, —or, as we should say, "all round"—and are fastened first on to rails, which are then secured in their places. As the back is seldom thick enough to hold the hooks, a rail must be used there; and it is better, though not so necessary, to have them on the ends. When a really first-class job is wanted, the rails on which the hooks are fastened are made to slide in and out. Above the hooks a shelf is often placed; but as the space for hanging might then be

made too short, it is generally found only when there is no bonnet box below.

It may be useful to mention that the hanging compartment is seldom supposed to be finished till it has been lined—a glazed, striped lining being generally used for this purpose. Though it is more the work of the upholsterer—generally only a young one—than of the cabinet-maker, the "jobbing hand" may be glad to know that the lining can be stuck on with strong paste applied to the wood, from which any ochre colouring—and there generally is some to disguise the pine in wardrobes bought in the neighbourhood already indicated—should be thoroughly washed off first. Lining is not a difficult job.

The plinth and cornice have been sufficiently mentioned, but it may be well to say that the latter should be fairly heavy in appearance, as shown in the illustration, which is drawn approximately to 1 in. scale, and should not consist merely of a slight moulding. To facilitate fitting together of the various parts, blocks should be fastened on to the top and bottom of the carcases, and fitting into the corners of the plinth and cornice.

The doors may be hinged within the ends or on them, the method, of course, being determined beforehand. When hinged within, the end must be thickened up for the trays to pass. The centre door—of which, by the way, the panel is generally looking-glass—may be either hung with centre hinges let into top and bottom, or with ordinary butts. In this case both ends of the hanging compartment project to an equal extent, and the hinges are fastened to the inner one, the edge of which should be faced up to match the rest of the outside.

To discuss the whole matter of hingeing wardrobe doors would, however, require considerable space, and no doubt enough has been said to enable any practical man to do what is necessary. If not, perhaps he will kindly state his difficulty for answer in the "Shop" column.

With the remark that a wardrobe of exactly the same external appearance may be made with short trays and drawers in one or other—usually the centre—of three carcases, these few hints on a 6 ft. long-tray wardrobe must be brought to a close, leaving the intelligent worker to make such modifications as may seem desirable to him.

TO CLEAN WALL PAPERS.

BY E. W.

STALE BREAD *v.* DOUGH—THE DOUGH: HOW MADE AND HOW USED—USEFUL FOR CEILINGS—AN EXAMPLE.

THE value of stale bread for the purpose of cleaning wall papers is very generally known, and its service more largely requisitioned than that of all other substances. It is splendid for the job, and deservedly in favour, but in many respects is not equal to the comparatively unknown "dough" process. This latter is cheaper, quicker, leaves no dust or crumbs about, and, with moderate care, will make an equally good job with a far less expenditure of labour. The dough for this purpose is simply a mixture of coarse flour and water, the coarser the flour the better, of rather stiffer consistency than for a pudding. About 1 lb. or 1½ lbs. of flour will be sufficient to clean the walls of, at least, one good-sized room, even though the paper be very dirty. The loose dust on the walls should first be removed by a soft broom or brush, and then the lump of dough passed lightly over the paper, when it will be seen to remove the dirt in its path as effectively as an indiarubber squeegee removes liquid mud from an asphalte road. The dough in use works soft, and in consequence it will be found desirable to have some flour in a bowl to roll it in occasionally. If not intended to wash the ceiling, it may with advantage be treated the same as the walls, though, if thus done, it will not, of course, have the brilliant whiteness of a fresh-washed ceiling. By this means I have, in less than an hour, well cleaned the walls and ceiling of a room 14 ft. by 12 ft. by 8 ft. The walls and ceiling were very smoky and dirty when I began, and the walls showed in very pronounced patches the parts that had been covered by pictures, pier-glass, furniture, etc., but when finished they presented an evenly clean appearance suggestive of new paper; the ceiling also looked very clean and presentable, though previously blackened by smoke. Certainly, for simplicity, ease, cheapness, and the facility with which this work can be done by anyone without any previous experience of such, this method of cleaning must commend itself to all who are actively desirous of securing a clean, attractive, and healthy home.

APPLIANCES FOR WORK TO BE MADE BY THE WORKER.

BY B. A. BAXTER.

GUIDE FOR DADO GROOVE, USED FOR GROOVING FOR PARTITIONS—TROUGH FOR PLANING BLIND-LATH EDGES—FOR PIANO SMALL WORK—ZINC TEMPLATES FOR MORTISES, CONTOUR OF MOULDINGS, ETC.—SUGGESTIVE VALUE OF ARTICLES ON BEEHIVES IN "WORK"—MITRE TEMPLATES OF VARIOUS KINDS—MORTISES TO PATTERN—BORING COLLARS—SETTING OUT FOR DOWELLING—ADVICE TO WATCH A POLISHER OR CARVER—FIXING SMALL HINGES.

FOR grooving across a board with a dado plane, the benefit derived from the use of a guide is not to be despised; the guide may be a piece of ½ in. wood having a straight edge, and it may usually be fixed with a bench holdfast, which, though it cannot be made by the wood-worker, is one of the most useful additions to his bench that he can possess (Fig. 25).

In cases where grooves are to be made at regular intervals, a piece of wood, having affixed to the underside of it a piece that fits the groove last made, will be useful; all that is needful is to be sure that the strip fitting into the groove is parallel with the edge which guides the plane, and that it fits the groove accurately (Fig. 26).

The "trough," used to reduce blind laths, etc., to a uniform width, ought to be mentioned as suggestive, though blind laths are cut so accurately now that the trough is not required for that purpose (Figs. 27, 28).

Very much akin to this is a contrivance used by pianoforte makers to plane hammer-heads, etc., to the exact thickness. As some readers are aware, the small parts of pianos are made by shaping lengths of wood cut across the grain to the desired figure, and then cutting slice after slice off by means of a circular saw. This plan to plane the parts to accurate thickness merely consists in fixing on a piece of wood two strips of the proper thickness so that the edges of the trying plane move upon them, while the articles to be planed are placed between and therefore in the path of the cutter (Fig. 29).

It may not be too obvious to mention the great utility of zinc templates cut to the figure of a rebate or a moulding, cheap and useful, and easily cut with strong scissors, saws, or chisels and gouges.

Various grooved or rebated pieces of wood which are useful to hold long, thin strips while being planed or rounded merely mentioned will suffice, although appliances suitable for all purposes will never be fully described; reference here to the papers on beehives and appliances will show what I mean: it is not necessary (perhaps not allowable for me) to speak of the merits of those papers, especially *this* feature of them.

Appliances rendering chisels more accurate in action and results strictly might include planes, by a stretch of licence, for a plane *is* merely a chisel so fixed in a block of wood that its angle is constant and its penetration limited; but for chisels merely, help is required to enable the worker to make the best use of them. The template for mitres is perhaps the most useful and best known (Fig. 30).

A diagram is here given of a template for cutting applied mouldings to ornament a panel; this template will serve for both sawing and finishing with chisel, and is made so that the moulding just fills the groove in the template (Fig. 31).

A template for stop-chamfer work is useful and easily made; the intersection of the angle of 45° on each face of the wood gives a facet equilateral and therefore equiangular, if the template and the material are accurate.

For making mortises, etc., for forms, door-frames, and anything beyond the usual scope of a mortise-gauge, it is useful to make model mortises on a piece of wood that can be applied to the work, and there is this advantage, that the same strip will do for the marking of the tenons as well (Fig. 32).

I remember well being led to this by being engaged with another in making forms, and my comrade would not or could not see the advantage of making all the similar parts interchangeable, so as he made the mortises, I had to make every standard a separate fitting.

For boring, we can help ourselves in obtaining uniformity of results by easily contrived expedients.

First as to the depth, we can of course bore a hole with the bit itself, and the piece of wood forming the depth gauge only needs to remain on the boring tool and to extend from the collar of the brace to the wood being worked on; in the case of centre-bits or other boring tools larger than the shoulder of the brace, two pieces of hard wood can be notched to fit the stem of bit and screwed together on it at the position desired (Fig. 33). Here, however, I feel compelled to make a digression, to tell of a countersink which also acts as a depth-gauge, useful to all who bore for screws; it is of steel with a hole in the centre and a cutter wound round the hole in a spiral form; it has a screw to adjust and fix it on to any pin, spoon, or nose-bit, not exceeding the size of the hole in centre. I am told that it will work satisfactorily with any bit, though considerably smaller than the hole in centre; this is because the adjusting screw brings the cutting edge into prominence. It is to be had at all first-rate tool warehouses, or will be soon, on account of its utility. I saw it at Melhuish's.

But to return to our home-made appliances: the need of some help to accuracy in dowelled work is so great that most workers

who make anything in which dowels play any important part are glad to have assistance. Let us suppose that a joint is dowelled with three dowels, we know that the thoughtful worker will not put them in line, or too close together.

Let us imagine a thin veneer or a card or piece of sheet metal is interposed between the pieces of wood to be joined, three pin-holes bored in the thin wood or metal can easily be transferred to either face of the joint, and so the distance apart of the three dowels may be equal each to each in both pieces to be joined; but if there is also a stop or a guard to one edge of the gauge, not only will the distance apart be correct, but the distance from the edge will be ascertained, and if the end needs to be flush, then a stop on the end will materially help accurate boring (Fig. 34).

There are many other expedients which may be adopted with advantage, but they are too numerous to mention here.

It is often instructive to see how a carver or a French polisher will make rough but efficient arrangements for the holding of his work, but I may mention a trifle which I have found very useful: it is merely a turned pin having a square-shouldered head, $\frac{7}{8}$ in. in the stem, and about 3 in. long, the head about $1\frac{1}{2}$ in. in diameter, and about $1\frac{7}{8}$ in. long; the $\frac{7}{8}$ in. portion is tapped, and the holes in the side of the bench are also tapped to fit. One or two holes on the top of the bench are also bored and tapped, and this little arrangement alone (or with the aid of a piece of wood in which the turned pin moves freely—that is, with a hole just large enough to clear the screwed portion) forms a simple and most useful help in cutting shoulders, sticking mouldings, and other similar works; used in the sideboard of the bench it not only supports the board, but also holds it to the bench. If thought desirable, the piece of wood just mentioned can be made 12 in. long, and a thrust screw fitted to one end: it then becomes in effect a hand-screw, and the bench one of the jaws; but I have found the simpler form sufficient for so many varied wants that the last-mentioned arrangement has been discarded. This is shown in Fig. 36, but the piece of wood is omitted, the head of the screw is shown round like a mushroom-headed screw, and the side of the bench is shown in a flat or horizontal position instead of a vertical position.

For fixing small hinges uniformly on a number of small boxes, a piece of zinc folded to a right angle having holes just where the screws for the hinges ought to be put has been very useful, enabling a lad to place hinges with little trouble to himself; if greater trouble had been required, he would not have supplied it (Fig. 35).

All these are mentioned as being suggestive, and if anything here mentioned proves to be useful, the writer will have his reward; but if this paper should lead anyone to try and devise some special aid to help accuracy and uniformity, then he will have had the greater satisfaction of helping the reader to help himself in a very true and real manner. It is, in short, in indicating to the wood-worker how he may facilitate his work by the adoption of some small contrivance that the value of this paper lies.

In point of fact, in carrying out any kind of work, and especially work in wood, it is surprising how the worker may help himself by resorting to some dodge or other similar to those which have been described above and in the preceding paper on this subject, and in this opinion I am inclined to think no practical man will be found who will refuse to concur, when he looks back over the extent of his own experience.

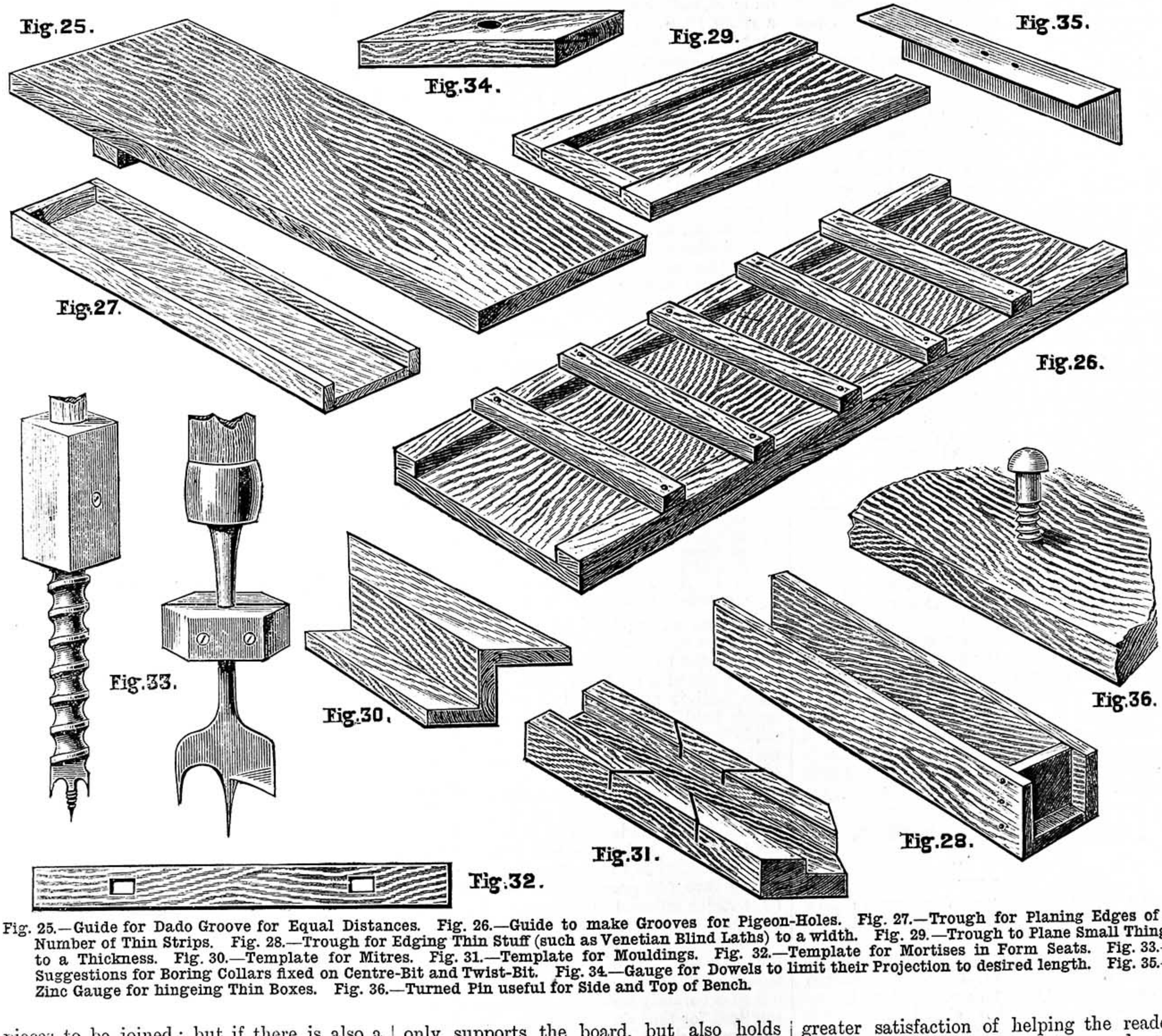


Fig. 25.—Guide for Dado Groove for Equal Distances. Fig. 26.—Guide to make Grooves for Pigeon-Holes. Fig. 27.—Trough for Planing Edges of a Number of Thin Strips. Fig. 28.—Trough for Edging Thin Stuff (such as Venetian Blind Laths) to a width. Fig. 29.—Trough to Plane Small Things to a Thickness. Fig. 30.—Template for Mitres. Fig. 31.—Template for Mouldings. Fig. 32.—Template for Mortises in Form Seats. Fig. 33.—Suggestions for Boring Collars fixed on Centre-Bit and Twist-Bit. Fig. 34.—Gauge for Dowels to limit their Projection to desired length. Fig. 35.—Zinc Gauge for hingeing Thin Boxes. Fig. 36.—Turned Pin useful for Side and Top of Bench.

HOW TO MAKE A THERMOMETER.

BY J. G. LISTER.

KINDS OF GLASS — THEIR ADVANTAGES AND DRAWBACKS — APPARATUS AND MATERIALS REQUIRED—CONSTRUCTION OF TUBE—FLUIDS EMPLOYED—FILLING WITH FLUID—CLOSING—GRADUATION—FREEZING POINT AND BOILING POINT—HOW OBTAINED.

IT will be well perhaps to preface our remarks on the operations necessary to the production of a thermometer with a few general observations on the nature and uses of different kinds of glass tubing.

Tubes are made of three kinds of glass: viz., lead, soda, and potash or hard glass, according to the principal ingredient, besides silica, present. Each has its special advantages, and each its special difficulty of manipulation. Soda-glass is soft and easy to work upon, but is liable to crack during subsequent cooling. Lead-glass is a little more difficult to handle, and in inexperienced hands is likely to be marred by the production of unsightly blotches of reduced metal, but is much less liable to crack during cooling. Potash-glass is very hard, and will resist great heat, hence it is more difficult to manipulate, but is not open to the same objection—cracking—as soda-glass or reduction as in lead-glass.

Now as to details. The apparatus required will be a lamp, preferably a Bunsen, blowpipe, small glass or earthenware basin, saucepan, small file ("three-square"), and a small funnel; and as materials some glass tubing, mercury or methylated spirit, and a few pieces of ice. The tubing should be what is called thermometer tubing, usually sold at 2s. per lb. under the numbers 33, 34, 35, and 36. Of this, ¼ lb. will be ample to make half a dozen thermometers, including failures.

Having all in readiness, we commence by cutting off a length of 14 to 16 in. of tube by means of the file: first making a notch, and then by a sharp pull separating the portion. The end of this short length must now be softened in the blowpipe flame, and continually rotated until the hole closes, and about ¼ to ⅜ of an inch is thoroughly softened. Then blow into the other end, using the muscles of the cheek only, until a bulb of the required size has been produced. At about 2 in. from the other end of the tube soften a small portion (about ½ in.), and, by means of a steady pull, cause the diameter of the tube to contract to such an extent that there is only the very finest of capillary tubes joining the two portions. This must be done with a firm but gentle hand; and while the tube is still soft, bend it to an acute angle with the greater length of the tube. Now break off the shorter length about the middle of the constriction, and the tube is ready for filling.

The fluids usually employed are coloured alcohol (methylated spirit coloured with any aniline colour; a small piece of copying-pencil serves very well) or mercury, though for most purposes the latter is preferable, for the following reasons:—First, it is opaque, and hence is readily seen; secondly, it does not wet the glass, and there is less error due to surface tension; thirdly, its co-efficient of expansion is large, and its specific heat is very low (·033 : *i.e.*, it requires less than $\frac{1}{30}$th of the heat required by water to make it expand to the same extent); and fourthly, its boiling point is high (662° F.), and its freezing point is low (— 38° F.), thus giving it a very great range of temperature.

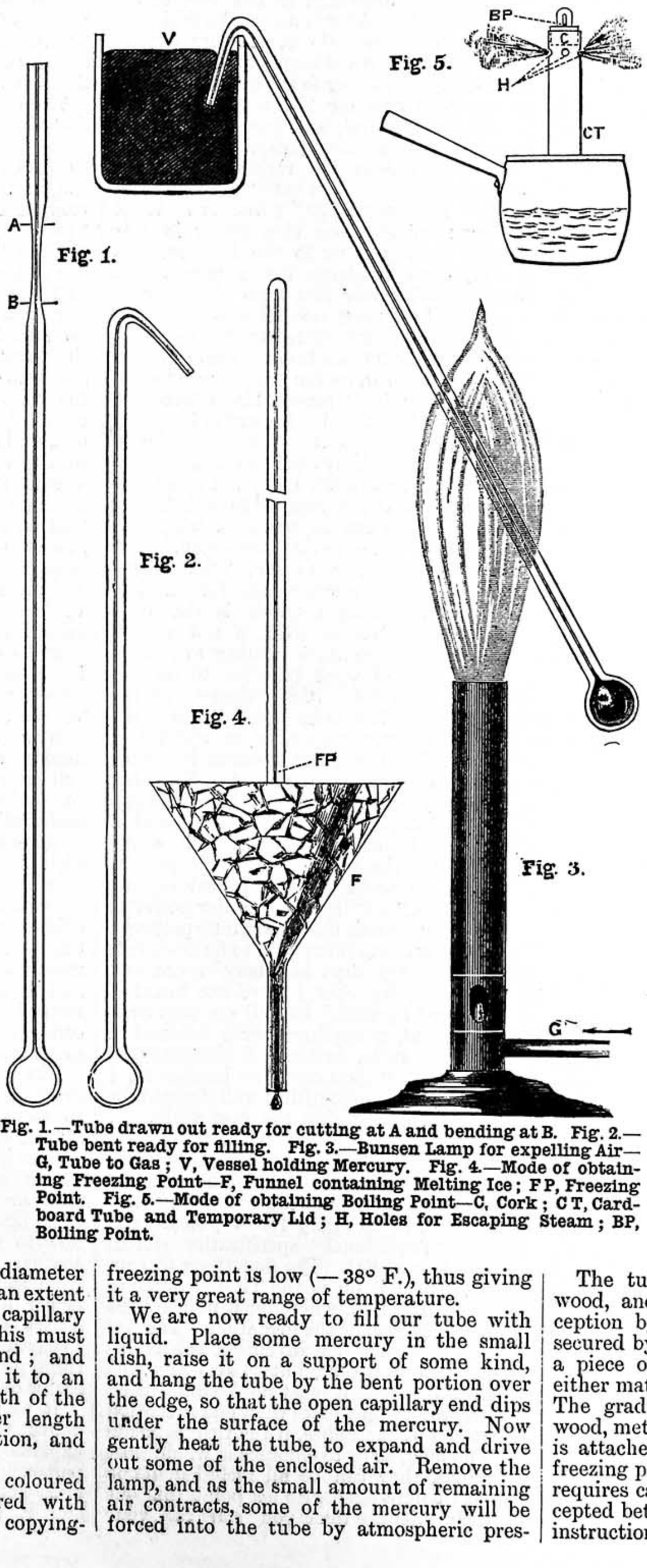


Fig. 1. Fig. 2. Fig. 4. Fig. 3. Fig. 5.

Fig. 1.—Tube drawn out ready for cutting at A and bending at B. Fig. 2.—Tube bent ready for filling. Fig. 3.—Bunsen Lamp for expelling Air—G, Tube to Gas; V, Vessel holding Mercury. Fig. 4.—Mode of obtaining Freezing Point—F, Funnel containing Melting Ice; F P, Freezing Point. Fig. 5.—Mode of obtaining Boiling Point—C, Cork; C T, Cardboard Tube and Temporary Lid; H, Holes for Escaping Steam; BP, Boiling Point.

We are now ready to fill our tube with liquid. Place some mercury in the small dish, raise it on a support of some kind, and hang the tube by the bent portion over the edge, so that the open capillary end dips under the surface of the mercury. Now gently heat the tube, to expand and drive out some of the enclosed air. Remove the lamp, and as the small amount of remaining air contracts, some of the mercury will be forced into the tube by atmospheric pressure. This must be repeated until the whole of the tube and bulb are filled with mercury. (If any mercury should stick in the tube, a few gentle taps with the finger-nail will generally cause it to flow downwards.) The final operation consists of removing the tube from the vessel, and heating the bulb *and* tube so as to bring the mercury near, but not quite to, its boiling point. This will cause it to expand, and will further drive out any imprisoned air, so that the tube will contain nothing but mercury and mercury vapour. Now, whilst the tube is still being heated, hermetically seal the capillary end by fusing in the blowpipe flame (taking care to *immediately* remove the lamp from the tube), and our thermometer is made, and it only remains to graduate it. Of course, in the final stage two sources of heat are necessary—one to heat the tube, and the other to use with the blowpipe; for the latter, a No. 12 tallow dip serves excellently.

Now as to graduation. The first thing is to obtain two fixed points: viz., boiling and freezing points (of water). To obtain the latter, which is usually got first, the tube must be inserted in *melting* ice, and a mark made on the glass just at the lowest point to which the mercury recedes. To obtain boiling point, the tube must be placed in the steam from boiling water, and a mark made on the tube at the highest point reached by the mercury. To do this, we must make sure that the *whole* column of mercury is in the steam. This can be done by replacing the lid of the saucepan by a piece of cardboard with a hole in it, in which is inserted a tube about 1½ in. diameter and 10 in. long, with a bored cork in the upper end, and a hole in the side to allow the steam to escape. By this means the whole of the tube and mercury will be kept at the B.P.

We must now decide what kind of thermometer we wish, Celsius (or Centigrade), Réaumur, or Fahrenheit. If Centigrade, then divide the space between B.P. and F.P. into 100 equal divisions, or 50 if great accuracy is not required, and each will be a degree (or two). If Réaumur, then divide into 80 equal parts. If Fahrenheit, divide into 180 equal divisions. Mark freezing point O° in C. and R., and 32° in F. If greater range be required, continue the divisions above B.P. and below F.P., taking care, of course, to put the correct numbers thereto.

The tube is usually let into a piece of wood, and held in the slot cut for its reception by small metal bands, or it may be secured by wire to a metal plate or even to a piece of cardboard, a hole being cut in either material for the reception of the bulb. The graduation should be made on the wood, metal, or cardboard to which the tube is attached, after determining boiling and freezing points on the glass. As this merely requires careful division of the space intercepted between these points into degrees, no instruction on the *modus operandi* is needed.

SOME WORDS TO WOULD-BE PATENTEES.

BY "AN INVENTOR."

INTRODUCTION — SPECIFICATIONS IN THE LAW COURTS—EMPLOYMENT OF PATENT AGENTS—AMENDMENT OF BAD PATENTS—SEARCHING—HELP AFFORDED BY THE PATENT OFFICE—FIRST THING TO BE DONE — PROVISIONAL SPECIFICATION — COMPLETE SPECIFICATION — PROVISIONAL PROTECTION: ITS MEANING, USE, AND EFFECT—PUBLIC USE OR KNOWLEDGE—UTILITY—FIRST AND TRUE INVENTOR.

HAVING read the papers written and remarks made in Vol. I. of WORK by "C. C. C.," page 545; "Minerva," page 446; "Patentee," page 574; "Loco," page 766; and "A Consulting Engineer," page 694, and being sure that WORK is intended to teach and show people how to do things themselves, I propose—being one who always prefers to do a thing myself if possible rather than to get it done by others—to add and explain in this article certain matters that as yet have not been touched on.

I read the article of "C. C. C." at the date of publication (Nov. 16th, 1889), and came to the conclusion that he was an intelligent amateur who had picked his knowledge up from popular works, and his experience of getting specifications passed through the Patent Office; therefore it is not at all surprising that he should make a mistake or two; but this much must be said in his favour—viz., the information and instructions that he does give are sufficient to draw up a *valid* patent, providing the article, or process, described is new and useful, and that the applicant is the first and true inventor.

It is quite a new doctrine to me that a patent specification should have to go through the Law Courts before being considered a "success." True, such an one stands on a better and different footing, but as "prevention is always better than cure," a specification so drawn that no one dare challenge it in the Law Courts is, in my opinion—and, no doubt, is also in that of everyone else—a more "successful" one than one drawn with *a point to argue on*, on purpose to find work for lawyers, patent agents, etc., to pocket fees, and so harvest some of the fruits resulting if the invention turns out a success. The great drawback to employing patent agents and other professional men in drawing up legal documents is, that while they take reasonable precautions to do the work so that it will stand the test of the Law Courts, they always leave a point or two open to argument. This invites litigation, and while a lawyer will not go into Court if he has no point to argue on, he will readily do so if he has, and the fees are forthcoming.

There is another drawback against employing a patent agent — viz., he always gives the address of his own office as the address of the patentee, if he lives in the United Kingdom of Great Britain and Ireland, no matter in what part. He does this on purpose to intercept any communication intended for the patentee, so that if it means a sale of the patent, or a licence, they can put their fingers on, in the shape of the inevitable "commission." This proceeding is not strictly a legal description of the patentee, and is one I should like to see "sat on." It passes, however, on the ruling "that everything is to be construed in the most beneficial manner for the advantage of the patentee," and the Courts will not annul a patent except for very good and sufficient reasons.

In one of the papers to which reference is made above nine heads are given under which a patent would be considered "*bad*," but they are given in such a way as to convey the impression that a "bad" patent is a *worthless* patent. Now, this is not so. Everyone of these bad points can be amended after sealing of the patent, and so it can be made a "good" one. Further, an unnecessary piece of advice is given, that, when an inventor has drawn up his specification, with drawings, to the best of his ability, "he should *at once*, as he will *then* be in the position to do so, institute a most *careful* and analytical search through all the specifications *relating to the subject*, in order to ascertain how far his invention or improvement is novel, and how far it is not novel, so that he may protect himself and define and obtain his rights by lodging *proper documents*." What "proper documents" is he to "lodge," I wonder? What is to prevent someone else, either in this country or any other in the International Union, from applying for a patent and taking priority over him while the inventor is making his "most *careful* and *analytical* search?" and how is he to examine anything on which a patent has been applied for, *anywhere in the world*, for ten months previously, which will, perhaps, render his patent void through anticipating his invention?

It is implied that this searching should be done by a properly qualified, professional patent agent, therefore I am not at all surprised that it is not said or hinted how or where a search can be made; I will, however, supply the omission further on.

It is hardly fair to say, "that apparently the best qualification for employment in the Patent Office is the least possible acquaintance with, if not a total ignorance of, all matters relating to patents and the kind of work that has to be performed." No doubt this "thrust" at the Patent Office has been given because the officials try honestly to carry out the Act of 1883, and do all they can to assist inventors applying for their own patents. This has been a very sore grievance with professional patent agents, and they got the thin end of the wedge in, with the Act of 1888, which provides for the registering of the present and the exclusion of new patent agents, as well as giving the Comptroller power to reject specifications if not drawn up properly, instead of sending them back to be amended; but as the Act says he "may" do so, and does not say he *must*, I have not heard of any being "rejected," but all are sent back to be altered, if anything amiss is found in them. As it is, instead of charging the officials with "ignorance" or incapacity, I think they are wonderfully well trained for their work, considering the vast variety of subjects they have to deal with.

When anyone has invented anything they consider of value, and they have reason to believe it is *new*, the very first thing they should do, is to apply for a patent, and lodge a "provisional" specification (forms A and B cost £1). The first thing to consider and decide on is the Title, or name to give the invention, which must indicate the *nature* or subject of the invention. The Act of 1883 says only one invention can be included in one patent, but it also says, the validity of a patent must not be questioned on the ground that more than one invention is covered by it; hence, if the title is made wide enough, so as to embrace a whole host of things, they can be all included in one patent—patent agents do *not* point this out to their clients—thus, you can call your invention "Improvements in Domestic or Household Implements or Appliances," and proceed to describe improvements in sewing, washing, wringing, or knife-cleaning machines, or any other thing used in the house; or, under the title of "Improvements in Agricultural Machinery and Appliances," you can protect improvements in every kind of machine or tool used in the farming industry; care being taken, in the specification, to call it *one* invention, simply dividing it into *parts*: for instance—the first part of this invention relates to improvements in reaping machines, etc.; the second part of this invention relates to improvements in thrashing machines, etc., and so on.

The Provisional Specification should only describe the *nature* of the invention; the more brief and vague it is the better. "C. C. C.'s" instruction to draw it out in full, as if a "Complete" Specification, is, I venture to think, a point on which he has "gone wrong," though drawing it in the manner he advises would not render it void, but it does lay the patent open to objection, as there is nine months to complete it in, during which time any improvements can be added, and claimed in the Complete Specification. Now, if in the meantime someone else should apply for a patent on the same thing, and his particular development of the invention is in the complete one, and not in the provisional, it is open for him to say it was got from him, and that if a patent was granted it should be only on the lines of the "Provisional." I don't know that he would succeed, though Sec. 4 of the Act of 1888 says he shall—the point has not been decided—but it is a debatable question, and might mean a lot of trouble and worry; while if the invention is only *described* in general terms, without drawings, it would be next to impossible to say the invention set forth in the Complete Specification was different to what is described in the Provisional.

Now, while only a short description is necessary in the Provisional Specification, a full description, full and sufficient directions for performing or carrying into operation, and a full statement of claims, with drawings, if necessary, must be given in the Complete Specification. In a properly drawn Specification, all three of these conditions or requirements are drawn separately, but as it seldom happens that a new thing requires a totally new mode of performing it, it is mostly sufficient to describe an invention, and direct in what manner it is to be performed, jumbled up together, as such a course saves paper and writing. The statement of claims *always* comes last.

The only conditions to be observed in drawing up a Complete Specification is to state clearly what you mean, avoiding all use of legal phrases. The simpler and clearer it is drawn the better; describe the invention clearly, pointing out the parts that are new and those that are old; then describe how to perform it—that is how to make or use, in such a way that anyone acquainted with the subject can, from the Specification alone, go and make, or perform the same. It is not necessary if a part is to be cast or turned in a lathe, etc., to explain how to cast or turn, unless something peculiar is to be done that an ordinary caster or turner would not know of.

It was said by two of the writers named above, that such should be so drawn and explained that at any future time, "any person" from them alone can make the article or perform the process. This is not so; it is quite sufficient if you merely

describe how the *new parts* are to be performed; you can even assume that everyone knows all about something described in a patent just granted.

The claims should also be clearly stated, and it is better to claim too much than too little, as it is much easier to disclaim than to make new claims. In claiming, all new parts can be claimed separately, so as to prevent such being used by anyone else; and such parts can be claimed in combination with old parts.

If all these are done clearly, and in such a manner that your *meaning* is clear, you have done all that the Patent Laws—not "Patent Office" please, as given by "C. C. C."—require. "The most experienced patent agent can do no more"; and such a Specification will always pass unscathed through the Law Courts on the question of drawing up. There are, however, a great many matters that affect the validity of a patent outside the question of drawing—that were not touched on by "C. C. C."—that require to be understood by every inventor, chief of which is the meaning and effect of the various terms used. I will take first:

Provisional Protection: its meaning, use, and effect. Before the year 1884 we had to lodge a Provisional Specification with our application for a patent, which was granted on such Application and Specification, on condition that a Complete Specification was filed within six months. We thus got our patent almost first, and we held all the rights of a patentee. But as the contract with the Crown was for what was described in such Provisional Specification, we could not insert or claim anything in the Complete one that was not mentioned in it. That has all been altered by the Act of 1883. We now get our patent on the "Complete" Specification, the Provisional one merely taking the place of the Caveat, under the old law, and by retaining the same appellation causes so much confusion. Few people seem to know or have any idea why the present form of Provisional Protection exists, or its real value to an inventor. Before the passing of the Act of 1883, very many complaints were made about the injustice suffered by inventors, in this country, in comparison with the United States of America. In that country an inventor has two years, after first publication, in which to apply for a patent: this gives him a chance to perfect his invention before patenting it; while in this country he could neither previously make it public or improve it, after applying for his patent. Several Commissions were appointed by Parliament to inquire into, and report on, the United States Patent Laws, and such Commissions pointed out that inventors in that country suffered very greatly, inasmuch as the *first* inventor alone had the *right* to the patent, and this without any regard as to when he invented the matter; so that if an invention proved to be valuable, the Law Courts were occupied for years deciding the claims of the various claimants. Some have run twenty years: notably the "Drive Well" patent; while the Telephone patent has been in the Courts testing its validity ever since it was invented. And as the temptation to copy a known invention, and bring up witnesses to swear to it, is very great, when a large sum of money is at stake, and the difficulties of detecting such frauds, it was agreed that such a principle could not be adopted in this country; therefore, while adhering to the strictly English principle of "first come, first served," it was provided in the Act of 1883 that when a person has conceived the idea or outline simply of an invention, he can apply for a patent, lodging simply a Provisional Specification, to enable the Comptroller to identify the invention with the Complete Specification. He then becomes provisionally protected—that is, as his patent is dated from the day of application, he takes priority over all other subsequent applicants; and Sec. 14 protects him from the consequence of publication or piracy, providing a Complete Specification is lodged within nine months, or ten months for £2 extra. Now, while this Provisional Protection gives the inventor no patent rights whatever—which "Patentee," page 574, contends it does—it protects the inventor in a very material manner: first, it gives him nine months to perfect, test, and mature his invention; secondly, it assures him a patent against all comers; and thirdly, it gives him seven months' Provisional Protection in the United States of America, and almost every other civilised country that has Patent Laws, all for the one fee of £1, payable to the British Patent Office. In all the countries comprised in the International Union, patentees have the same rights they have here, but of course they must apply for patents, if they want them, in those countries within seven months; but when they do so, they can have their patents dated back to the same day as the British one, and thus take priority over any subsequent applicant even in his own country. Foreign inventors have the same privileges or rights here, and not a few have already walked over British inventors; so while £1 will make an invention as safe as it is possible to make it, by following the advice given to first "search" at a cost of 21s. a day, an inventor may be forestalled. If an inventor feels safe about his invention at the end of nine months, he can abandon the first one and lodge another application, with a Provisional Specification, providing he has not made the invention *public*, which is termed:

Public Use or Knowledge.—This is quite sufficient to invalidate a patent, no matter how drawn. The principle on which this works, is that if an inventor makes his invention known to the public, there is no need to grant or offer him a patent to induce him to make public his invention—it would be equal to making one a present and then asking for payment. Nor is a man entitled to a patent for what the public already knows of, uses, or can get to know in this country; but such publication must disclose sufficient knowledge how to make or perform the invention to one who understands the subject. If the invention is an article put on the market in the way of trade, it may be assumed that all who get one, can take it to pieces and copy it; but if no one has had such an opportunity, and that it would be impossible to make such articles or perform the invention, there is no publication such as is necessary to invalidate a patent: not even if the very identical articles are described in a patent specification; for bear in mind the patent is granted in exchange for the disclosure of a *practical* mode of performing the invention, so that if no practical mode is disclosed of performing or producing the invention, the patent will not only be void, but it will not operate as an anticipation of a subsequent patent that does disclose a practical mode. This question was settled in the House of Lords (see "Betts *v.* Menziers," 10 H. L. C., 117). So what an inventor should do when he finds a prior patent has been taken out for his invention, is to examine if the disclosed mode of performing it is practical; if not, he can claim everything shown in it, as a just reward for his *practical* mode. As a great many patents are only for "paper" inventions—that is, inventions that have never been worked or tested in a practical manner—the chances are great that they are failures, *i.e.*, impracticable. Some people also consider that *ideas* are inventions and patentable. An invention may be, and often is, the result of an "idea," but it must be a realised result, with all the details of carrying it out, so as to serve a useful purpose. If it fails in this, it is no "invention," or patentable, so that an inventor can get his "ideas" from anywhere he likes.

Utility.—This also is necessary to support a valid patent—that is, it must serve some useful purpose. It is often set up as a plea against a patent that is being worked, which is absurd, as the mere fact of its being *worked* is proof that it is "useful"; but it is a good defence against an impracticable patent, the owner of which is trying to levy blackmail, under the charge of infringement, on a subsequently successful and useful patent.

First and True Inventor.—This is a matter on which a great deal of misconception prevails, especially as it means one thing in this country and another in America. In the United States, it means the first person who actually works or produces the invention. It really means in law, the person who first conceives the idea, but the Courts draw the line as above, as it would be absolutely impossible to test a man's *mere word* in any way, so that the Patent Laws would have been a farce. In this country, it means the first person who imports it from abroad, no matter how he obtained it, or who in this country having *bonâ fide* invented it himself, *first applies for a patent on it.* If he has obtained the invention by fraud, or "picked it up," being the invention of someone else in the United Kingdom, he is not the first and true inventor, nor entitled to a patent. Thus, if he is an honest inventor, or importer, and is the *first* who applies, he takes priority over all others, no matter how long they have been keeping their inventions secret.

I must reserve further remarks for another and concluding paper.

MEANS, MODES, AND METHODS.

To Raise Bruises in Wood.

Often in working soft wood, such as pine, etc., anything falling on it, or it getting knocked, produces a nasty bruise, which to plane out would reduce the wood, and, in many cases, would not be practicable. It is not generally known that bruises can be raised up again level with the surface by pouring in the hollow "produced by the bruise" methylated spirit, and setting it on fire, not allowing it to burn itself out, but blowing it out before the spirit is exhausted (or it will burn the wood). It will be found in most cases that the bruise has come up level with the surface; but if badly knocked or bruised, it will require more than one application of spirit, always blowing out the light after the spirit is burnt away. Bruises of nearly every description can be raised in this way.

H. H.

A Safe Way of Hanging Pictures.

Occurrences are frequently being recorded of the falling of framed pictures, and the narrow escapes of bodily injury therefrom. Lately, a picture fell in an undesirable way in a room of the house wherein I live; a small boy fortunately having, the moment previously, passed over the spot whereon it fell.

From this and similar incidents, I have been induced to give my humble attention to some simple means of preventing, as far as is possible, the likelihood of an accident occurring to any precious member of what we are told is the evolutionised ape family.

As the method I have adopted is simple, and requires so little extra labour, no reason remains why it should not be given a trial. It consists of nothing more than the use of *two* cords, or a single cord doubled to answer the purpose of two, instead of the use of but one cord. Fig. 2 gives a back view of a frame supported in such a manner, and Fig. 1 a side view of the same. If the rings are large enough, by all means have two cords; if not, then it will be sufficient to carry one cord through and tie it around each ring and to itself.

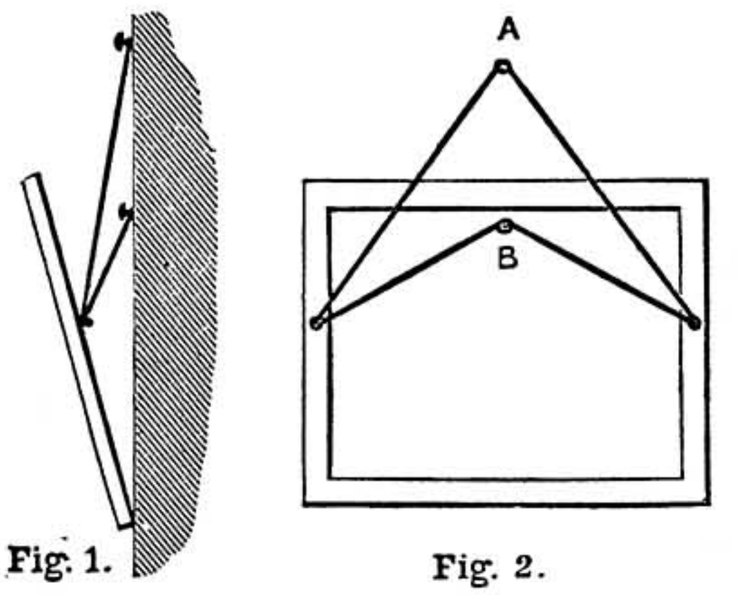


Fig. 1. Fig. 2.

Fig. 1.—Side Elevation of Picture and Cords. Fig. 2.—Back Elevation of ditto.

Difficulty will be experienced in hanging pictures thus, as I can testify from personal trials. Perhaps the best way will be to use a prop whose length shall be sufficient to allow enough to project beyond the bottom of the picture to handle, while its top end is in contact with the lower loop for the purpose of hitching it on to its destined nail. To ascertain the accurate distance to fix the two nails apart from each other, place the two loops of the frame as in Fig. 2, and measure the length of the space between points A and B.

If pictures are supported in this manner, the top cord will be relieved from bearing so much weight as it would otherwise be compelled to; but should it chance to break, the lower cord will prevent the picture from falling, and *vice versâ*. J. S.

To Clean Glass.

An excellent way to clean glass, especially adapted for picture glasses, glass cases, windows, etc., is as follows:—Procure a *clean* bottle, and put in one part of strong ammonia, and add about eight parts of *clean* water. Cut a groove down one side of the cork, and, replacing it in the bottle, we have a supply of liquid, which can at any time be sprinkled on the glass we wish to clean. If the glass is very dirty, we shall want two dusters, and sprinkling a little of the liquid on the glass, and wiping it with a duster, the dirt, etc., will be easily removed; after which, a few more drops sprinkled on and a clean duster, the glass will clean and polish up beautifully. H. H.

MASONS' WORK.

BY MUNIO.

Tools and Appliances used in Masons' Work — Scaffolding — Hoists and Cranes — Centres—Mortar, Cement, and Concrete —Foundations—Setting Out.

Tools and Appliances used in Masons' Work.—The tools used in masons' work are the walling hammer (Fig. 10), for hammering and dressing walling stones; the trowel (Fig. 11), for spreading the mortar; the jointer (Fig. 12), for drawing the joints, and for tuck-pointing. A bit-hammer is also used for dressing stones. It is a short hammer, with a mortise hole at one or both ends, into which bits of various shapes can be fixed. A kevel, which is a hammer similar to a walling hammer, but much larger, is used for cutting and breaking up stones. Iron wedges of various sizes are used for cutting stones; they are fixed in grooves, and struck by the kevel. The points of the wedges should not touch the bottom of the groove, or they will fly out when struck; and, to get a clean cut, a crowbar should be laid solidly under the stone.

A plumb-rule is used for plumbing angles; a level for levelling stones; a line for walling; and straight-edges and rules of various sizes are used, but these need no description.

The mallet (Fig. 13) is used for dressing stones; the point (Fig. 14) is used to knock the rough off stones; the chisel (Fig. 15) is used for drafting: they are made from $\frac{1}{4}$ in. to 1 in. broad; the boaster (Fig. 16) is used to level the surface of a stone; a broad tool, similar to a boaster, but $3\frac{1}{2}$ in. or 4 in. wide, is used for tooling. The hammer and punch (Fig. 17) are used for roughing off hard stone; the pitching tool (Fig. 18) is used to knock off the edge of a stone to a line: it is only used on hard stone; the claw tool (Fig. 19) is used on limestone and marble; the lead mallet and lettering tool (Fig. 20) are used for cutting letters: the tool is $\frac{1}{2}$ in. in diameter at its widest part, and the edge is spread out; they are made in various sizes.

The chisels are sharped in a smith's fire, and are tempered to various degrees of hardness. For soft stones they are drawn out thin, and made moderately hard; for hard stone they are not drawn out so much, and tempered harder. After being sharped, the edges are rubbed on a stone till quite straight. The mason ought to learn to sharp his own tools.

The drag (Fig. 21) is used for levelling down the rough in Bath stone; it is a piece of steel plate, with teeth on one side; they are made of various forms, and with teeth of different degrees of fineness. Teeth saws are used on Bath stone and magnesian limestone. Plate saws without teeth are used on Portland stone, marble, and granite: they are fed with coarse sand and water. For sawing large blocks, tooth and plate saws, from 5 ft. to 7 ft. long, are used: they are fixed in frames similar to a joiner's turning saw; the frame is suspended by a rope passing over a pulley, with a balance weight at the opposite end. A handle is fixed at each end of the frame, and the saw is worked by two men. A groove is cut as a guide for commencing saw-cut.

In large works, steam-sawing, dressing, and moulding machines are used. Marble and granite, after being sawn, are polished with large cast-iron plates, fed with sand and water, which are revolved upon them; these plates are called laps.

The stone-pick (Fig. 22) is used for broaching. A hammer, called a diamond hammer, is also used for broaching. It has six or more steel points fixed in mortise holes in the face, and is hammered over the face of the stone.

The granite hammer (Fig. 23) is used for knocking up granite; it is also dressed by the mallet and chisels, and axed by a tool similar to a short thick hammer with a broad point, called an axe.

Squares, bevels, straight and circular rules of various kinds, are used for marking stones, a piece of hard black shale called "black," or thin pieces of hematite iron ore, being used to draw the lines. Measuring laths, gauges, zinc and wood moulds, iron crowbars, and rollers are also used.

The Lewis (Fig. 24) is used for hoisting stones. It is in four pieces, fixed together by a pin and cotter. A dovetailed hole is cut in the stones, in which it is fixed. Clips or grips are also used for hoisting. They consist of two large hooks, with a ring fixed in each. They are connected together by a chain passing through the rings. The hooks are let into holes at each end of the stone, and the tendency of the chain pulls the hooks together, and causes them to grip the stone.

Scaffolding. — The scaffolding used for ordinary works is made with poles 20 ft. to 30 ft. long, fixed 10 ft. to 12 ft. apart. Ledgers are fixed horizontally to the poles by scaffold cords; the ledgers are 7 in. by $2\frac{1}{2}$ in. On these are laid the putlogs, which are $5\frac{1}{2}$ in. by 3 in., with one end resting on the wall. On these are laid the scaffold boards, which are deals, 9 in. by 3 in.

Hoists and Cranes.—For hoisting stones up to $\frac{1}{2}$ ton in weight, ledgers are fixed about 10 ft. above the scaffold at both sides, and resting across these a strong frame about 9 in. wide is laid. An iron rail or bar is fixed on the top of the frame at each side, and a carriage with four grooved wheels runs on the rails. To this a pair of pulley-blocks is hung, by which the stone is lifted, and is run to its place on the wall by the carriage. The rails are turned up at each end, to prevent the carriage running off.

For heavier stones, shear legs are used. They are made of strong poles, 20 ft. to 30 ft. long. They are lashed together at the top, and the bottom ends spread out 10 ft. or 12 ft. They are kept perpendicular by two long guy ropes fastened to the top, and put round posts let into the ground at the bottom. A pair of pulley-blocks with a fall rope or chain is slung from the top, and the weight is raised by a crab-winch (Fig. 25). In order to take the strain of the guy ropes, the rope is brought round a block fixed at the foot of one of the legs, called a "snatch-block" (Fig. 26).

When a building is of great length, a hoist similar to Fig. 27 is used. This is made of squared timber fixed on a strong frame, in which two grooved wheels are fixed. These run on a single iron rail, laid the full length of the building. A cross-head, with a pulley at each end, is fixed on the top, over which the fall rope passes. A crab is fixed on the frame for hoisting, and the hoist is kept perpendicular by two guy ropes. Sometimes a small steam hoist is fixed on the frame instead of the crab.

Derrick cranes (Fig 28) are also used for hoisting. They are fixed inside the building, and the jib is arranged to sweep round the walls. When the building is too large for one jib to reach round, two or more are used. They are fixed on the various floors as the building is carried up.

Fig. 25.

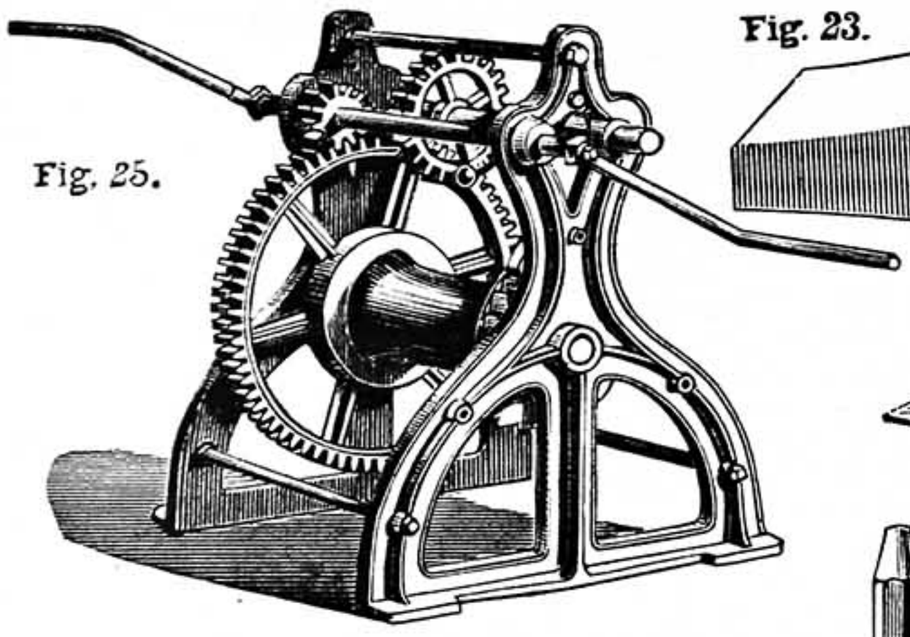


Fig. 23.

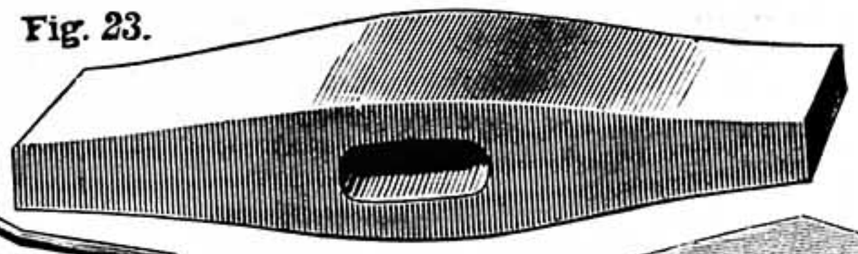
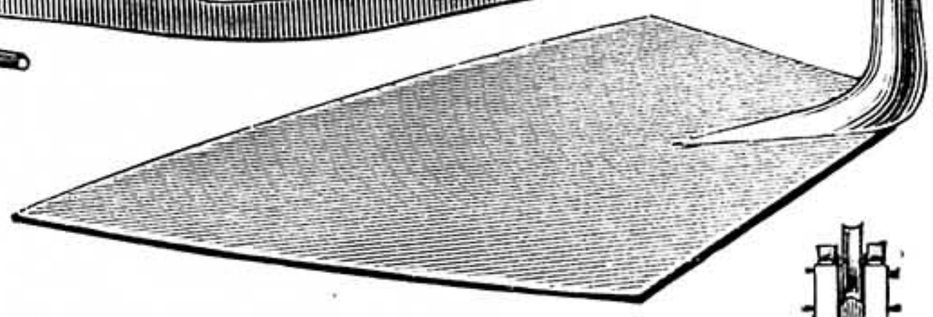


Fig 11.



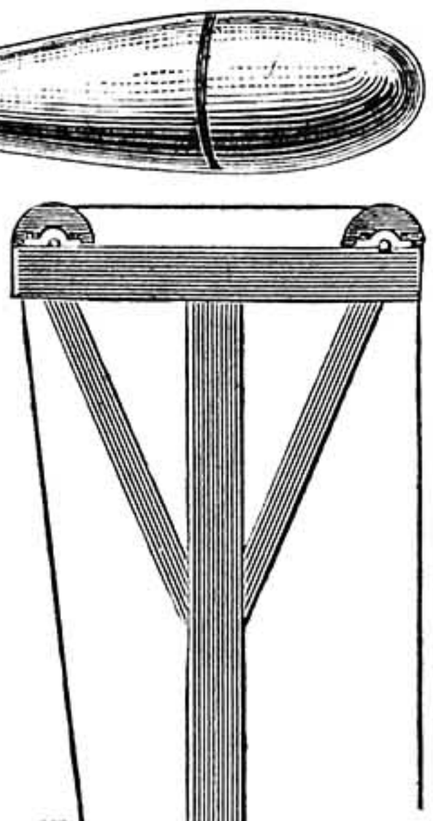
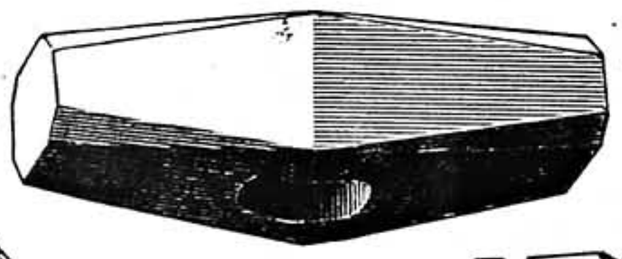
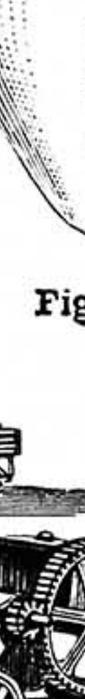


Fig. 17.





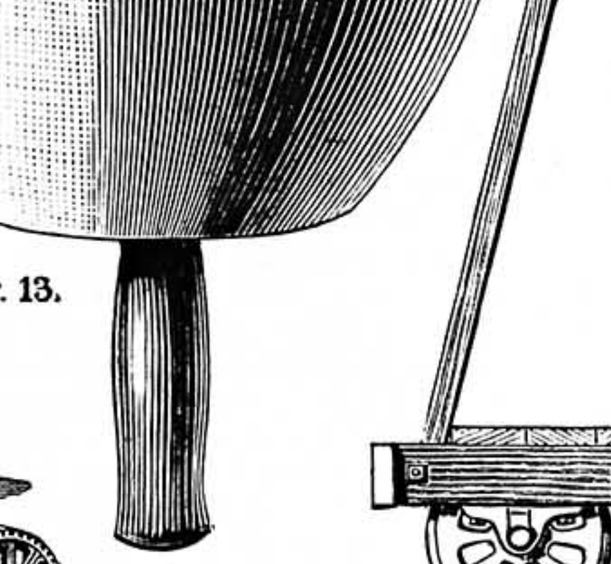


Fig. 21.

Fig. 10

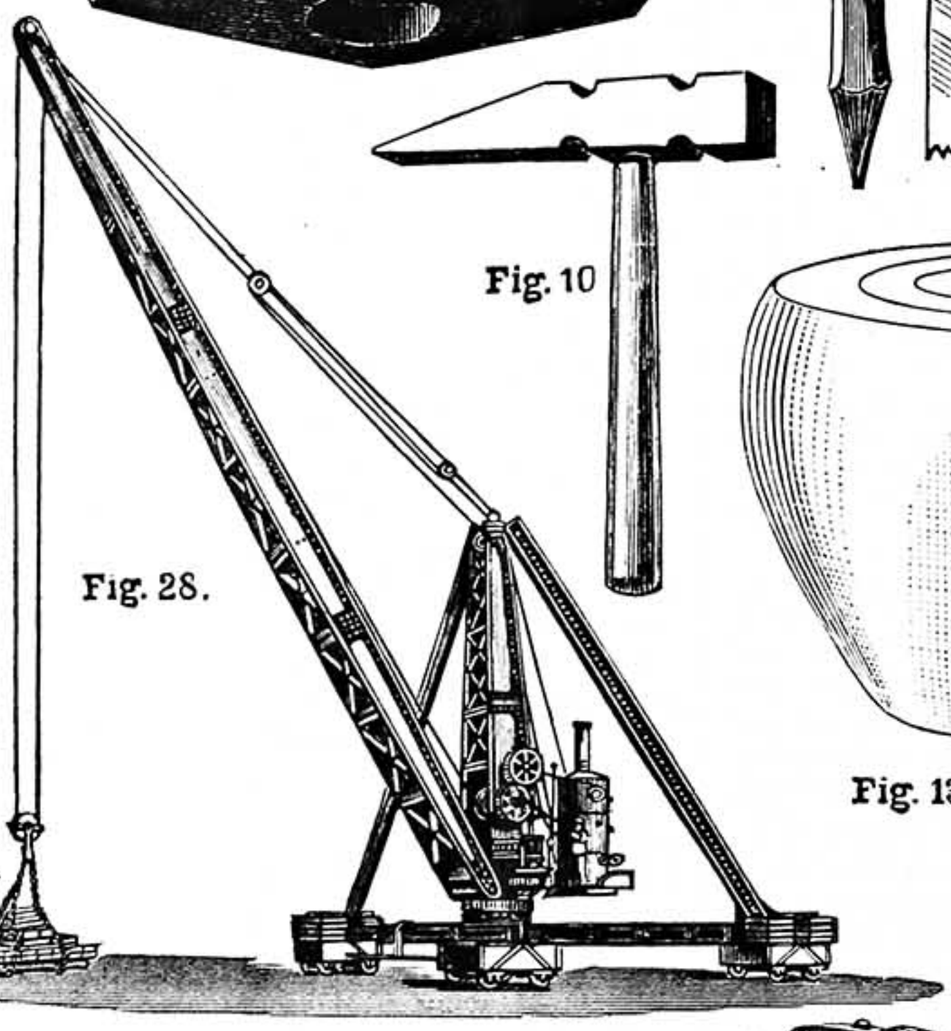


Fig. 28.

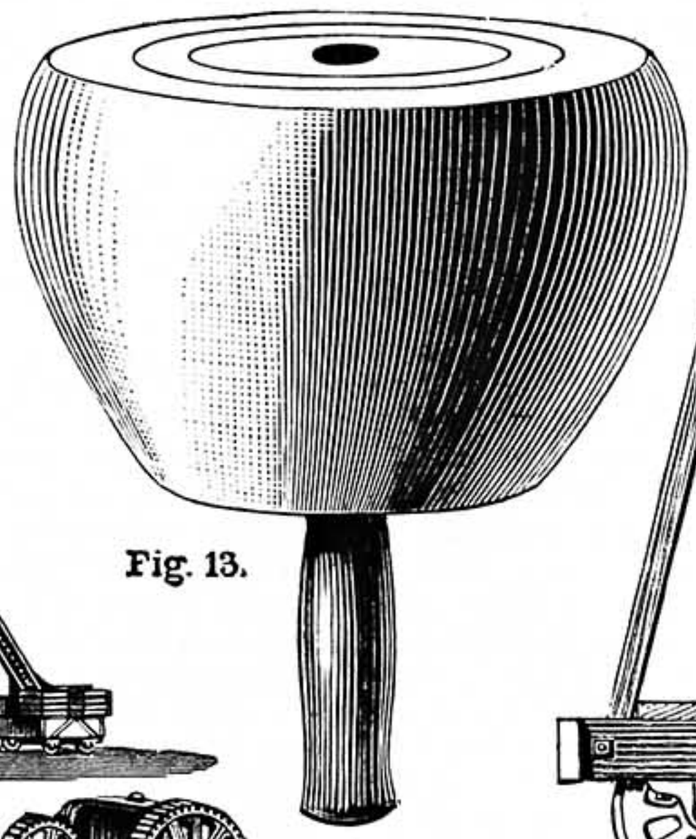


Fig. 13.

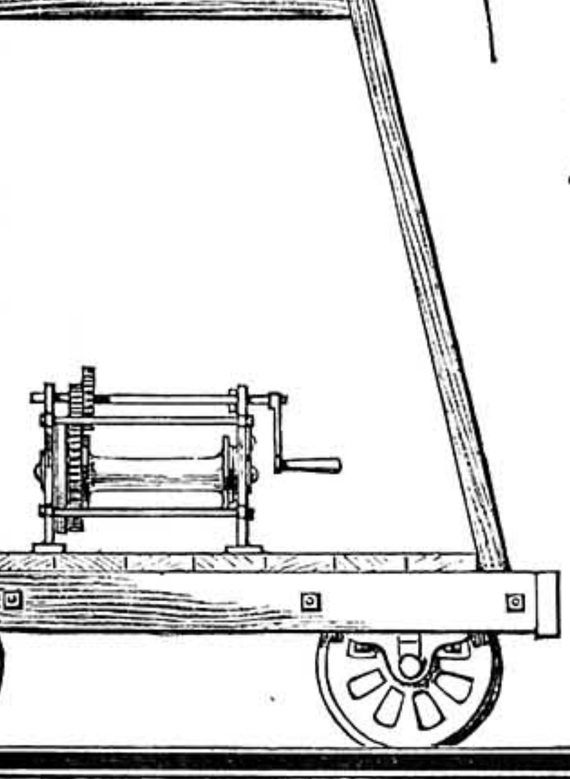


Fig. 27.

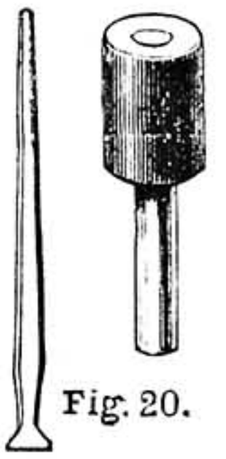


Fig. 20.

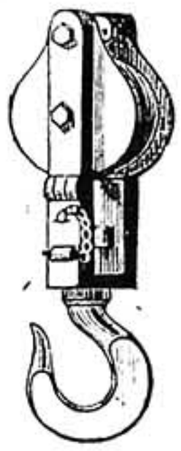


Fig. 26

Fig. 22.

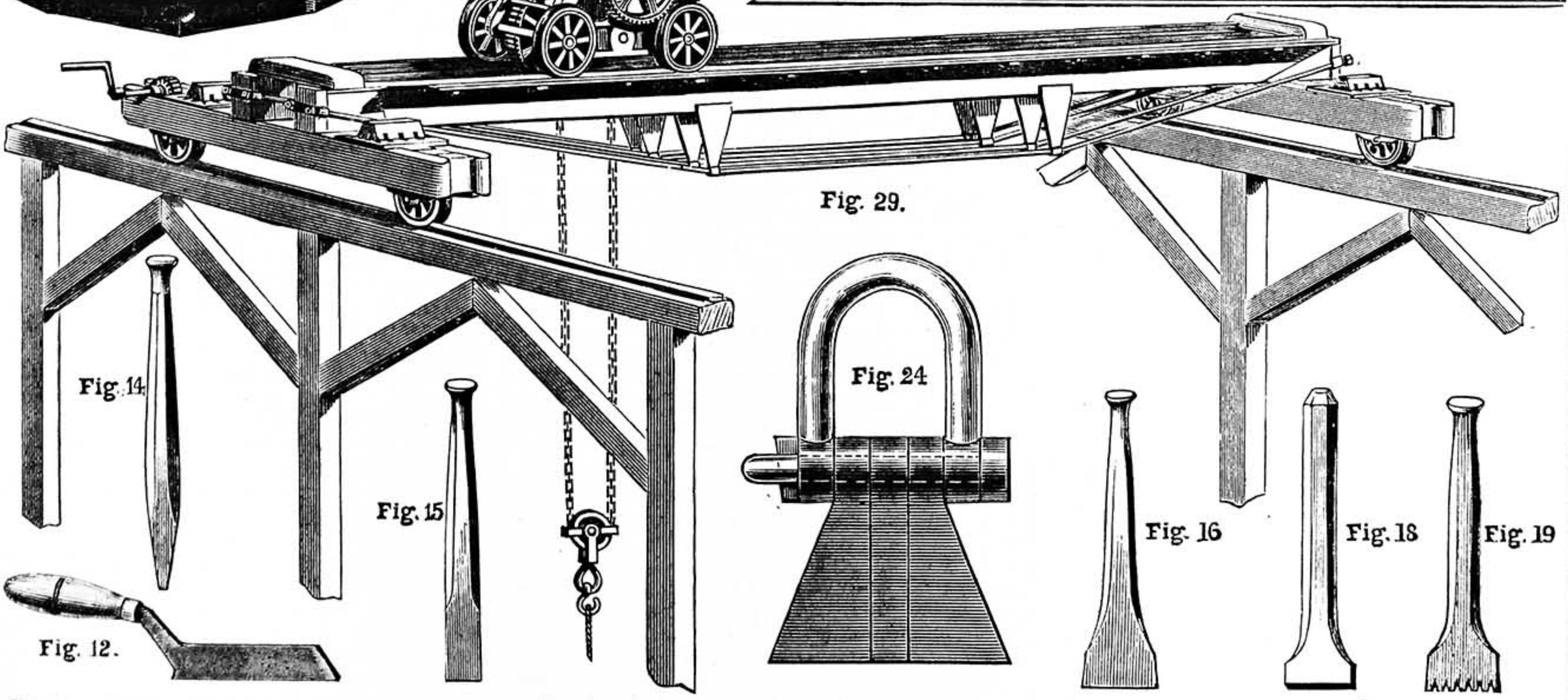


Fig. 29.

Fig. 14.

Fig. 15

Fig. 12.

Fig. 24

Fig. 16

Fig. 18

Fig. 19

Fig. 10.—Walling Hammer. Fig. 11.—Masons' Trowel. Fig. 12.—Pointer. Fig. 13.—Masons' Mallet. Fig. 14.—Point. Fig. 15.—Chisel. Fig. 16.—Boaster. Fig. 17.—Hammer and Punch. Fig. 18.—Pitching Tool. Fig. 19.—Claw Tool. Fig. 20.—Lead Mallet and Lettering Tool. Fig. 21.—Masons' Drag. Fig. 22.—Stone-Pick. Fig. 23.—Granite Hammer. Fig. 24.—Lewis. Fig. 25.—Double Purchase Crab-Winch. Fig. 26.—Snatch-Block. Fig. 27.—Hoist. Fig. 28.—Derrick Crane. Fig. 29.—Overhead Travelling Crane.

When a building is very large, and the stones are of great weight, the overhead travelling crane (Fig. 29) is used. It is mounted on iron rails laid on strong timber framing, formed of baulks 12 in. square, and strongly braced and stayed. The crane is moved lengthways by gear wheels, and the crab on the top is either moved by gear wheels or pushed by the men walking on the platform. The framing is generally fixed half the height of the building at first; and when the building is brought up to that level, it is raised.

Centres.—Centres are also used by masons for turning arches. Those for bridges, or arches of large span, must be very strongly made, and fixed on firm supports. In all cases, wedges, or some means of slacking the centres as soon as the arch is keyed, should be provided; and in removing large centres, the ribs should be well stayed, as many serious accidents have occurred when the centres were suddenly released.

Mortar, Cement, and Concrete.—The mortar, cement, and concrete used in masons' work is similar to that used by bricklayers, and is fully described on page 183, Vol. II.

Foundations.—The foundations for walls should be neatly squared out, and the bottom made level. When the ground has an inclination or slope, the foundations should be "stepped," and the bottom of the trenches kept level. A drain should be laid from the lowest point of the foundation, to carry off the water. When soft or wet places occur in the foundation, the trench should be carried down to firm earth, and filled with concrete, and a drain laid to carry off the water. In large buildings a bed of concrete is often laid over the whole of the foundations, on which the footings are laid. The turf and vegetable soil should be taken off the whole of the interior of the site; and where wood floors are laid, a layer of concrete or asphalte should be laid over the surface, to prevent damp arising.

Excavations for cellars, basements, etc., should be accurately marked out, and squared down to the bottom, and a drain laid from the lowest point, to clear them of water. After the walls are built above the surface of the ground, the trenches should be filled in, and well rammed down.

Setting Out.—In setting out a building, centre lines should be stretched both ways. These should be accurately squared, and fixed in saw notches cut in the tops of pegs driven well down; all walls can then be gauged from these. Interior walls should all be gauged from the centre lines, and not from each other, so that any error may be more easily detected.

A fixed level should also be set up. This may be the floor or base line, and all levels may be taken from it.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

26.—"Ardenbrite" Liquid Gold.

If any reader is inclined to ask what "Ardenbrite" is, I can tell him that it is a duly registered trade mark, and a distinguishing name applied to some excellent so-called liquid gold, metallic enamels, and metallic paints used for decorative purposes, and manufactured by Messrs. T. Pavitt and Sons, 70, Southampton Row, London, W.C. If I am further asked the derivation and meaning of the term, I can only reply that I believe it to be an imposing, but at the same time playful, way of disguising the Queen's English by making "hard and bright" appear as one word "Ardenbrite," inasmuch as the words which may be assumed to be its original source fairly describe the durable and brilliant qualities of the materials to which it is applied. To take the three principal forms of Ardenbrite in order, the "Ardenbrite" Liquid Gold, which, if I remember rightly, is the oldest of the three, does not tarnish, and washes well; its makers claiming for it that it lasts three times as long as real gold leaf. Be this as it may, its effect is brilliant, and the surface, when hard and dry, presents a highly finished appearance. It is very generally used by the trade for decorative purposes in theatres, tea-rooms, and public places of resort, and by the principal railway companies in the United Kingdom, and the most important lines of ocean steamers. To those who do any painting and decorative work at home it will prove invaluable. It can be applied with excellent effect to any material whatever, even to leather, for it is much used for decorating and renovating ladies' slippers in its various colours—gold, silver, red, and green. It may be obtained of all artists' colourmen, chemists, oilmen, etc., in jars at 6d., 1s., 1s. 6d., and 2s. 6d. It is used without any preparation beyond stirring it well up, and it can be applied with an ordinary paint-brush. For trade prices, application should be made to Messrs. Pavitt & Sons. The liquid enamels manufactured by Messrs. Pavitt & Sons are another form of Ardenbrite. These are sent out in gold, silver, copper, green, steel, and red; and by their aid the surface of any material can be quickly covered with a brilliant coating of metallic enamel which dries within half an hour; and which, when perfectly dry, is permanent and washable, and requires no varnishing. It can be applied over paint or varnish without removing the old coating. Last in order come the Ardenbrite Enamel Paints, which are supplied in white, vermilion, blue, sage-green, primrose, and black. These are said to produce by the application of two coats a surface like china, which dries perfectly hard in six hours. I think I may fairly say that those who use Ardenbrite in any or all of its three forms will not fail to be satisfied with it.

27.—Woolhouse's "Measures, Weights, and Moneys of all Nations."

This is the seventh edition of a book that I have used for purposes of reference for many years, and I am glad to meet with it again in its revised and amended form. It was written originally by Mr. W. S. B. Woolhouse, F.R.A.S., F.S.S., etc., and is published by Messrs. Crosby Lockwood & Co., Stationers' Hall Court, Ludgate Hill, E.C. It supplies the means of readily converting the standard, linear, and square measures of one country into another, as well as the measures, weights, and moneys of all nationalities, and "the comprehensive principles which influence the fluctuations of exchange are also briefly stated, and correct rules given for computing the sterling value of coins and bullion. Not the least valuable portion of its pages are those devoted to an exposition of the measures of time, pertaining to the Gregorian, Hebrew, and Mahometan calendars, with a table of the principal epochs. To almanack makers this portion will prove especially useful. Besides a large variety of miscellaneous and interesting information on other matters, the Appendix gives particulars of the new Weights and Measures Act, 1889; a reliable account of the weights and measures of Japan and China; and full and authentic information on the subjects of Wire and Plate Gauges, and, more especially, in relation to the new Imperial Standard Wire Gauge, which was legalised by an Order in Council in 1883. The volume, which forms one of Weale's Rudimentary Series, has been much improved by being issued in a neat cloth binding—a considerable improvement on the old style, in which the edges of the boards of the cover were flush with the edges of the paper.

28.—Screws and Screw-Making.

Nothing seems to come amiss to the Britannia Company, Colchester, which, not content with a good reputation for making engineers' tools and appliances, and lathes and machinery of every description, seeks to do a large second-hand trade in goods of the same class, and, lastly, to pose as the publishers of some strictly technical works. The latest of these is a book entitled "Screws and Screw-Making," with a chapter on the milling machine. It claims to be "a complete treatise on screw-making in all its branches, embracing most recent methods, and containing the reports which originated modern standard screw-threads." The nature of the work will be best understood from a brief summary of its contents. After a preliminary chapter showing the different kinds of screw-threads now in use, the writer proceeds to describe the Whitworth, American and Swiss systems of screws, and the British Association screws. This is followed by instructions and remarks on chasing screws by hand, screw-plates, dies, and taps, and cutting screws on the lathe. Then comes the consideration of arithmetical rules for calculating wheels, a table of change-wheels for screw-cutting, and an explanation of the difference between, and mode of cutting screw or spiral wheels and worm wheels. The volume is brought to a close with remarks on screw-making, various tables of screws, and an account of the milling machine and some of its best types, as stated above. The work has a good though not very copious index, and is rendered all the more valuable by having bound up with it about 104 pages, which contain notices and engravings of the leading specialities of the Company, and form as good a price list of the Company's tools, machines, and appliances as any man need have. I must not omit to say that the price of the book is 3s. The writer has done his best to collect and epitomise all necessary information on the subject; and those who desire to make it their study, either for acquiring a knowledge of it for trade purposes or for competitive examinations, will not fail to find the volume, as far as I can judge from a cursory examination of it, both useful and reliable.

29.—Patent Simplex Fire Escape.

The fire escape that bears this name has been patented by Mr. William Petty, 4, Straithmartine Terrace, Drayton Road, Leytonstone, Essex, who makes the apparatus, and will supply it and fit it up in the houses of those who may wish to avail themselves of the means of escape it affords in cases of fire, when it is impossible to quit the house in the ordinary way, and egress must be sought through an upper window. The escape itself consists of a long canvas shoot or bag, open at the upper end, and having another opening near the bottom. The lower end is closed by an ornamental metal disc and locking gear, the purpose of which will appear presently. This bag, when compressed into its smallest compass, is contained in a metal case, which is placed in the ceiling of the room in which it is to be used, between two joists that are immediately over the window. Thus it lies completely out of sight, the only visible sign of its presence being the metal disc with which the opening in the ceiling is closed. The upper end is attached to a stout and strong piece of rope, whose other end is securely fastened to the joist. Should there be occasion to make use of it, the only thing to be done is to throw up the lower sash of the window and pull the cord attached to the disc in the ceiling. This brings out the bag, which must be thrown through the window, and is caught and held steady by someone standing below. The mode of descent is to enter the bag at the top and slip down it to the opening at the bottom, whence an easy exit is obtained. The bag itself is made of fireproof canvas, so that it cannot be injured by flames issuing from the house below the window from which it has been thrown. For nervous or frightened women or children it seems to afford a safe means of escape.

The Editor.

SHOP:

A Corner for Those who Want to Talk It.

*** *In consequence of the great pressure upon the "Shop" columns of* Work, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letter from a Correspondent.

Rate of Circular Saws.—A Woodworker writes:—"If a man lays out £10 or £12 in a machine, he expects that machine to turn out an extra amount of work to repay him. Therefore, when a man buys a hand-power circular-saw bench, he expects more work done with it than with a hand rip saw; and as I think the speed of a circular saw and feed of timber may be reduced in proportion to the power, and be an advantage, we will try, as briefly as possible, to see what advantage there is in a circular saw being driven by hand over a hand rip saw. The standard speed of a circular saw driven by steam and other power is about 3,000 revolutions per 12 in. saw per minute; and the rate of feed in cutting timber one-third its diameter, about 15 ft. per minute; and the power required, near 1½ H.P. Now a man, being calculated to be about ⅛ of a H.P., turns a wheel 4 ft. or 5 ft. in diameter at the rate of 30 revolutions per minute, which is a good speed for a man to turn. From this wheel a 12 in. circular saw is driven, the speed multiplied 10 to 1; that is to say, the saw makes 10 revolutions to 1 of the wheel: then 10 times 30 is 300, the number of revolutions the saw makes in a minute, which would be $\frac{1}{10}$th the speed of the saw driven by steam power. Now then, if the feed of timber to the saw driven at 3,000 revolutions is 15 ft. per minute, the feed of the timber should not be more than $\frac{1}{10}$th of that with a saw running 300 revolutions per minute, which would be at the rate of 18 in. per minute. Again, in calculating 8 men to 1 H.P., and 1½ H.P. being required to drive a 12 in. circular saw at the above speed and feed, a man would be but $\frac{1}{12}$th of that power; therefore the feed needs to be reduced at least to $\frac{1}{12}$th of 15 ft., which would be 15 in. per minute. Again, when a saw is driven by steam, by keeping the steam up to a certain pressure the same power may be maintained for any length of time. But it is not so with a man; after turning the wheel a short time his strength diminishes, and the power exhausted is not more than $\frac{1}{10}$th, and perhaps much less when the rate of feed has to be reduced in proportion, the feed being 12 in., and perhaps much less, per minute. Now then, we take a good hand rip saw, properly sharpened, and in a 3 in. deal it should advance at least ¼ in. each stroke, making 40 strokes per minute, which is not very fast; it rips 10 in. per minute. But how much easier does the man with the hand saw rip the 10 in. than the man who turns the wheel drive through the 12 in. or 15 in.? The man at the wheel will not turn many minutes before he wants to rest and dry the sweat from his brow, and while he is resting the man with the hand-saw is still at work, at the same time having a civil chat with a friend or shop-mate. Now, taking all things into consideration, I contend that if the hand rip saw is properly worked it has an advantage over the circular saw driven by hand. I should like any reader of Work who is an employer and has a hand circular-saw bench, when he has a deal of ripping to do, say in 3 in. stuff, to get both circular and hand rip saws in good condition, and set two men at work, one at the wheel and the other at the hand saw, and see at the end of three hours which saw has the advantage—neither man to be relieved during the three hours—and report in the 'Shop' corner of Work. It must be remembered, too, that to work the circular saws satisfactorily two men are required."

II.—Questions Answered by Editor and Staff.

Lettering on Carts and Waggons.—C. W. (*Worcester*).—Writing names on carts and waggons is a very simple affair, as plain block letters are generally used for all country rolling stock. I have painted some dozens of railway waggons and carts in times gone by, and I always used ordinary paint, thinned out from time to time with a little turps, as for common work of this kind, and a lot of it to do, speed is everything, and the more simple the diluents the less likely one is apt to go wrong. I think this is where you are in difficulties, as I frequently suffered from the same cause myself. In putting the last coat of paint on the cart or waggon, it is made to contain as much boiled oil as possible, so that it may dry with a good gloss, and also keeps out the weather better. Now, this surface is fatal to good lettering, as the letters will keep "cissing"—*i.e.*, running into ragged edges. This may sometimes be prevented by using nearly all turps in the colour you are writing with, by rubbing the surface with a little turps or by wetting with a leather. If this will not rectify, then repaint the part where letters are to go, write them, and when dry, varnish. If your paint runs down your brush, you either use it too thin or you are using long lining pencils instead of writing pencils, or you get your pencils too full. Do not dip your pencils into a pot of paint—rub some out on a piece of glass, and take the colour off of there.—H. L. B.

Staining Walking Sticks.—H. S. (*Graffham*). You do not say what colour you wish to stain your sticks of holly, hazel, and ash, or whether you have stripped off the bark or retain it. I can only presume that you have stripped off the bark, and wish them stained the usual brown or black, then French polished or varnished. A useful brown stain can be made by dissolving 2 oz. of asphaltum in nearly ½ pint of turpentine: give one or more coats with a piece of soft rag, or sponge, till you get the required shade. If this cannot be readily procured, thin some Brunswick black with turps. When dry, French polish, or give several coats of spirit varnish; but I fancy in your case you would find it better to give them a coat or two of patent knotting. For the black sticks, procure some black aniline dye, sold in penny packets, or use black ink; rub well till you have a black ground, then give one or more coats of black enamel. How to make a stick out of a cabbage-stump is, I think, beyond us. If you have a particularly fine one you wish to preserve for ornamental purposes, you might clean and well dry it, then give a coat of some clear varnish, such as copal.—Lifeboat.

Pantograph.—T. W. (*Sleekburn*).—Apply to any toy dealer or fine art dealer for a Pantograph.

Cement for Aquarium.—J. J. B. (*Twickenham*).—See pages 354 and 750, Vol. II.; also Indexes to Vols. I. & II.

Parlour Clock.—R. H. (*Accrington*).—The only thing I can suggest is to drill a hole in the case opposite the hour you wish it to ring, stop the hole with a cork, and let the end of a wire from one end of your battery go through the cork sufficiently long enough to catch in the hour hand. You must bend it down so that it does not touch the minute hand; let it lie on the face of the clock, rising from it a little, so that the hour hand must drag over it. Let the other wire from battery go to bell, and wire from bell to one of the legs of clock case; by bending the end of the wire over which the hour hand passes in the direction the hand goes, you can have the bell ring for an hour or more if your battery lasts out. You can buy a bell and battery for a few shillings from any electrician, or you can buy the material and make up your own bell, etc. You will find other methods in back numbers. To stop it ringing, simply disconnect a wire from the bell or battery, and put it on again when you go to bed.—A. B. C.

Grandfather's Clock.—Bowton Lad.—If it is only the pivot broken off, you might turn another one on the end and put in a long bush; if it is broken in the middle, the only thing is to put a new piece. The pallets in the old English clocks are often brazed on, and sometimes riveted to a brass collet, which is soft-soldered on the shaft. French clock pallets are generally fitted on a square, and so can easily be shifted, as you say, by gently tapping with a light hammer. The cost of a new pallet shaft will depend entirely where you take it, and may vary from 2s. to 5s.—A. B. C.

Verge Watch.—Verge.—I can confidently recommend Messrs. Haswell & Sons, 49 & 50, Spencer Street, Clerkenwell, and Grimshaw & Co., 35, Goswell Road, Clerkenwell, for repairs and conversions. But good verge workers are very scarce, and I doubt where you could get it done as it used to be fifty years ago. Messrs. Haswell converted an old verge for me a few weeks ago, and made a splendid job of it; and although I always do my own verge repairs, I have no doubt they would do it to your satisfaction.—A. B. C.

Clock Conversion.—Old Clock.—To make a chime quarter clock from an eight-day English and two twenty-four hour clocks is, in my opinion, an impossible job, as the plates are not large enough for the extra train of wheels; and it is a thousand to one that the wheels and pinions would not be the proper number and size. Then it would require all new dial-work, and unless you have had some previous experience you would find it very complicated. The only thing I can advise is to fix up one of the twenty-four hour movements as a quarter arrangement, as set out in an article in Work some few weeks back. The only drawback is, you would have to wind it every six or seven hours.—A. B. C.

Lantern.—E. O. S. (*Rye*).—E. O. S. writes:—"Which is most in fault when a picture shown from a magic lantern is capable of focussing either sharp in the middle or sides, but not the two together, the objective or condenser? Mine is a £6 6s. lantern and lamp."—With a lantern of the price named, and by the maker he has mentioned, E. O. S. ought not to find any very great difficulty under proper conditions. At the same time, the maker does not guarantee the instrument to be in focus in the centre and margin at the same time if a short-focus front-lens is used, for the simple reason that it is impossible. Still, there ought to be a fairly sharp picture. Is it possible that in taking out the lenses to clean them they have been replaced wrongly? If so, then that may account for some confusion of rays. Or has E. O. S. properly adjusted the lamp? There is an exact position, which must be found by trials, where the best definition can be procured. If after every precaution I found the definition hopelessly bad, I should return the instrument to the maker, who, I have no doubt, would properly adjust it.—O. B.

Bootmaking.—E. J. S. (*Maidstone*).—This is a subject which will be thoroughly dealt with in the next volume of Work.

Wood-Carving Patterns.—W. H. R. (*London, E.*).—The figures in the Index refer to the pages of each issue of Work, and not to the numbers themselves.

Theatrical Posters.—A. L. S. (*Glasgow*).—An article is in hand.—H. L. B.

Graining Cheap Furniture.—J. M. (*High Harrogate*).—You evidently wish to know how the cheaper kinds of furniture are painted and grained; but, of course, there are many ways in which this is done, in order to bring the goods within the means of people who have but little cash to spare. In the first place, furniture can be painted and grained by the same methods as are used for all other kinds of woodwork; but it is very seldom any high-class work of this kind is put upon furniture, as it is only the cheapest goods which are so treated, as you yourself must know. If you wish to grain in the ordinary way, then the following books will be useful to you: (1) "House Painting, Graining, and Marbling," by E. A. Davidson, 5s. (Crosby Lockwood & Co., London); (2) "The Art of Graining and Imitating Woods," £1 11s. 6d., shortly to be raised to 2 guineas (G. Sutherland, 15, St. Ann Street, Manchester). The latter will be the most complete work ever issued on this subject. I will now describe how the very cheapest kinds of furniture are "got up" in this way, and as it is only known to a few, the process—although I cannot commend it—may prove of general interest, as by the substitution of patent size for oil paint in the first coats, the element of cheapness, as well as a rapid method of manipulating the various processes, is thereby attained. The method consists of mixing up "patent" or glue size with the best gilders' whiting, the size being used moderately strong; this is stained to required shade for the ground colour, such as with venetian red for mahogany, with yellow ochre if for oak, etc., etc. The furniture is coated with this mixture whilst hot, and *is well worked into the wood.* If one coat is not enough, give two. Finish off with a coat of clear size. The graining can now be done upon this in oil colours, rose pink and a little black being mixed with it for mahogany or rosewood; umber and ochre for oak, etc. When it is wished to imitate maple wood, it is best to give the goods one coat of oil paint over the sized surface got up with the priming *white.* It may be thought that this work is not lasting, but it is said to withstand hard wear for years; personally, however, I cannot say, but bedroom furniture, not having much rough usage, is said to last any amount of time. Patent knotting on a sized surface, or the knotting first and size afterwards, in conjunction with enamel colours, is much used in large furniture factories; also the size and whiting process, with one coat of paint on the top for painted furniture. Deal furniture, finished in patent knotting, if carefully done, has a good appearance, and may be either varnished or French-polished afterwards, but for this style the furniture requires to be well made.—H. L. B.

Wire Blind Writing.—A. V. W. (*Cheltenham*).—Mark the letters out on the blind in pencil, and then go over them with parchment size; they may then be painted or gilded in the ordinary way. Gold paper letters may be fixed to blinds in the following manner. The gold paper—the best—is coated at the back with strong gum, like postage stamps, but with a much stronger solution. When dry, the letters are drawn, or traced, at the back, and cut out with sharp scissors. They are then wetted at the back and stuck upon the wire gauze, or zinc, the words being previously set out on the blind in the usual manner. The gilt paper may then be varnished over with copal, or any clear, hard-drying varnish, which will enable them to be washed at any time. In varnishing the letters it is necessary to carry the varnish a little over the ledge of the letters, thus preventing the damp from getting at the back of them. (From the "Art and Craft of Sign-Writing.") Wire blinds may be cleaned as follows: Take some methylated spirits in an egg cup, put in a piece of cotton wool, let it soak in the spirit, and set it alight. Then hold the parts of the wire blind over the flame. The old paint may then be brushed off. If the bores of the blind are choked up, remove by inserting a hot needle. When quite clean, varnish with white, hard varnish, and the wood frame with brown, hard varnish. To remove old letters from blinds without injuring the gauze, place that part of the blind which the letters are on upon a piece of wood, so that the gauze lies quite close to the wood. Then apply a solution of *pure* caustic soda with a common fibre brush. A very short time will suffice to destroy the paint and turn it into mud, which must then be washed away with plenty of clean water. The wood beneath the blind confines the solution to that part of the blind only where it is needed, and keeps it from running away.—H. L. B.

Blow-Lamp.—Vulcan No. 1.—In reply to your inquiries for a blow-lamp, or self-acting blow-pipe, that will braze ½ in. solid iron, and ¾ in. iron tube, and that will also braze a gold or silver ring, there are several that will do the latter. The one sold by Melhuish, illustrated on the cover of the Exhibition No. of Work, seems well suited for this class of work, but I have not had the opportunity of testing its powers. With regard to the brazing of iron, the

lamp most likely to do that is the Paquelin, fully described in WORK, No. 32, Vol. I., p. 505, and since then mentioned several times in "Shop." I must say that it is a severe test, and I am not at all certain that it would do it. It might under favourable circumstances—that is, that the parts to be brazed be supported on willow charcoal blocks, the work must be somewhere out of colds and draughts, and a deflector held over the top: it might then possibly do it. ⅜ in. iron I know it will do; the ¾ in. pipe would be harder still to do, if you mean gas pipe, and I am very doubtful about it. However, there is no more powerful lamp in the market at present, so it is Hobson's choice—that or none. I may say that the agents advertise it as giving 1,000 degrees of heat (see back page of No. 105, where price and other particulars are given).—R. A.

Blow-Lamp.—E. D. (*London, S.E.*).—See reply to VULCAN No. 1 above.—R. A.

Bottle Lettering. — FAIT ACCOMPLI. — The names on bottles, lamp glasses, etc., to which you refer, are cast on by the manufacturers at the time the articles are made. An amateur could not do it.—W. E. D.

Saw Grinding.—T. J. (*Handsworth*).—If T. J. would write to a good Sheffield saw-maker stating size, thickness, and number of saws he wants made, he would get them cheaper than he could make them. For the size T. J. states the price would be about 3s. or 3s. 6d. each, and as he requires a good number, no doubt he would get them for much less. Of course T. J. will know whether he can make them for less than the above price. There are various methods adopted for grinding saws. One is to place the saw between two revolving grindstones and grind until the hammer marks almost disappear. After which the saw is placed between face-plates, and while revolving is fed with emery. I believe there are improved grinding machines by Messrs. Eadon, Sheffield. By these machines saws are ground to a degree of uniformity which is impossible by other methods. In fact, concave, bevelled, convex, and saws of any pattern can be ground with the above machines to any thickness.—A. R.

Leather in Binding.—F. R. H. (*London, N.W.*).—You want me to tell you how to distinguish the difference between Levant morocco, Morocco morocco, and second morocco. Well, I can tell morocco when I see it, but really I cannot give you any information which will enable you to do so. The tooling has nothing to do with it.—G. C.

Phonograph.—J. S. (*Newcastle-on-Tyne*).—These instruments are not for sale, but are let out on hire. If you write to the Edison Phonograph Company, 60, Ludgate Hill, London, E.C., you may get some information.—W. D.

Wax Cylinders.—X. Y. Z. (*Bradford*).—They are cast in a special mould, which must be of a diameter sufficient to ensure them being slipped on and off the rotating cylinder.—W. D.

Violin Bridges.—J. M. (*Newcastle*) and other correspondents wish to purchase COMME IL FAUT'S violin bridge, described in WORK, Vol. II., page 810. COMME IL FAUT should advertise his address, etc., in WORK.

Bookcase.—T. M. (*Gateshead-on-Tyne*).—I can only ask you to search diligently the Indexes to Vols. I. and II., for designs of bookcases, in both the body of WORK and "Shop." You can easily adapt fretwork panels if you find a design the general appearance of which you feel satisfied with. See the three prize bookcases in Vol. I.—J. S.

German Clock.—J. S. (*No Address*).—See that the hook drops fair in the middle of the notches on the count wheel, and try each one. You may find perhaps that it catches just on the corner dropping in, and so goes on striking, or perhaps the wire that drops down and catches the pin does not drop far enough to catch it safe, or it may perhaps start off striking at the warn. See that when the stopping-pin is freed at the warning that the other wire is up high enough to catch the pin and hold it till they drop at the twelve.—A. B. C.

Moulding Figures in Plumbago.—NAP.—I can bring no experience to bear on this question, and doubt whether any other figure moulder could; but, had I the job to do, I should try mixing the plumbago (which would, of course, be in fine powder) with a like quantity of plaster of Paris. But before using the bulk, I should feel my way by experimenting on small quantities; for as a large proportion of plaster would interfere with the appearance of the plumbago, it would be well to use no more than would suffice to make the mixture set firmly.—M. M.

Circular Saws.—P. F. (*India*).—If P. F. does not know the whole art of saw hammering, my advice to him is not to attempt to temper his saw or saws. The following information I recently received from a well-known Sheffield saw maker, which will not only answer the question asked by P. F., but will give him and many other readers of WORK such information as will, no doubt, be very acceptable. To make a circular saw that will give satisfaction requires an amount of skill and much labour. The sheet of steel, after being rolled in the rolling mill, is placed between the jaws of a powerful shears and pared to its shape; then the holes are either bored or punched instantaneously with a steam hammer. Then it is put into a toothing machine and the teeth punched; after put into a fiery furnace, and when red-hot, is plunged into a large bath of whale oil—this is termed hardening, in which great care is to be taken. Then it is put into a furnace heated with hot air, and when properly heated, put into the whale oil; then taken out, and if too hard to file, put back into the furnace again and brought to its proper temper. The saw is now ready for the smith, whose duty it is to get the saw level or true by means of hammering. This hammering is done by the most skilled workmen—the art of hammering requiring considerable judgment. After the hammering, the saw is put into the grinding machine and ground to its desired thickness. The saw is further improved by being glazed with a special machine. Another method of tempering saws is to get the saw hot, plunge it into a mixture of oil with suet and wax, then take it out and heat it over a fire till the grease inflames. This process is termed blazing. The saw is then flattened while warm, and subsequently ground. A circular saw when at its proper temper should be a pale blue colour, which colour is removed in the grinding.—A. R.

Bird Stuffing and Mounting. — POLYITE JOINER.—There is a book edited by L. Upcott Gill treating fully with the art of Taxidermy. It is published by the *Bazaar Exchange and Mart*, Strand, price 7s. 6d. Ward & Co. also publish a book on bird preserving, price 1s.; this treats of skinning the birds, and is a very good book for a young beginner. With this book, and a few hours spent in the Natural History Museum, anyone could make a very good start. Waterton, in his "Wanderings in South America," published by Macmillan & Co., price 6d, gives full instructions for skinning and preserving birds for cabinets. Artificial eyes can be procured at Gardner's, 29, Oxford Street, London. As a preserving solution, corrosive sublimate can be made with eighteen grains of perchloride of mercury to ten ounces of water.—F. H.

Castings. — A CONSTANT READER. — Castings cannot be got up "nice and smooth" by the use of chemicals—that is, not to obviate the necessity for turning and filing. They can only be cleaned from adherent sand and scale. In the case of brass, this is done by immersion in dilute nitric acid—say, one of acid to eight or ten of water. An hour's immersion will suffice, after which they will be removed, washed in water, and dried in sawdust.—J.

Tool Fitting.—ARSENAL.—You can apply at the War Office, Pall Mall. But why not call at the Arsenal, and ask for foremen of departments? Little notice is taken of letters.—J.

Tempering, etc.—A. R. (*Blairgowrie*).—(1) Malleable cast iron *can* be welded by the same methods as wrought iron, but the joint is never safe, nor strong. As far as practical science is concerned, therefore, it is unweldable. (2) Welding cast steel is one of those jobs that every smith cannot tackle. The art consists in getting the precise temperature, which varies with steel of different qualities. *It should always be the lowest temperature at which it is possible to make the weld.* You must clean the surfaces as with wrought iron, but sand alone will not do for the flux, as is the case with iron. You must either use sand and burnt borax, or ground glass. (3) Temper drills, to bore hard substances, by plunging them into a block of *lead*, instead of into water or oil. Use paraffin to lubricate the drill.—J.

Incubator Regulator.—B. N. (*North Seaton*).—Look at the illustration carefully, and you will see that the well is open to the atmosphere. A little heat, of course, passes off, but no air, because it is sealed by the water which it moves up and down. The arm working on a hinge has nothing to do with the interior, and is fixed on the wooden top of the incubator.—C. M. W.

Couches.—LEMUR.—Couches like your sketch are generally made of walnut or oak, the framing part of beech, ash, or birch. Nearly all the wood that is seen is worked by the wood-turner and carver. Sizes of ordinary couch are about as follows, it being understood that there is no hard and fast rule as regards size. Length of couch on frame (not allowing for scroll projecting), 5 ft. by 2 in.; width, 2 ft.; height from floor to top of seat-frame, 11½ in. or 12 in.; height to the top of scroll from floor, 2 ft. 3 in.; height of back from floor, 23 in.; back about 9 in. shorter than seat. It should be framed up of 3 in. by 2 in. stuff, the rails tenoned into the legs; the round or elliptic end is sawn out in two pieces and dowelled together; the rails should be tenoned in the whole breadth at this end, and the legs allowed to stand up 1 in. for strength, the round end to be dowelled to the legs. The rails should all be kept back from the front of the legs ⅜ of an inch, to admit of the facing being put on, so that when it is on all will be about flush or level. On the front the scrolls are dowelled into the rails, and flush with them. These are made of 1¼ in. stuff, same shape as the finished scroll. The carved scroll is then glued on in such a position that it forms a rebate on the inside edge, to allow for the stuffing, and a little over the other edge for the same purpose. The legs are turned out of 4½ in. stuff, and the squares cut down all round to make the turning project boldly. Two ½ in. iron rods are put across the frame to give strength and hold against the pull of the webbing which goes across the frame for the stuffing; these are fixed in the following way: Holes are bored to receive the rods in the inside of the rails about ¾ in. deep; the length of rod is calculated for, and the rods are put in at the same time as the frame is glued up. The carved and turned pillar at the end of the back is out of about 3 in. stuff, and tenoned into the seat rail, and the rails which carry the spindles are the same width as pillar, and about 1 in. thick moulded on the edges to match the bottom moulding. A piece of 1 in. beech is glued on to the top side of the top spindle rail about ⅜ narrower on each side—this will form a rebate for the stuffing. These are dowelled into the pillar and into the scroll at the other end. The spindles go in with a pin at each end; the middle panel is dowelled in; all sharp edges should be taken off with a rasp to prevent cutting the stuffing materials. In cramping on the round end, it will be found of great service to cut a notch in the rails and in the shaped piece in order to get the cramp on to pull by. These pieces should be glued in again, and a bit of canvas glued over them.—H. H.

Inlay Wood.—OLD READER.—There are many kinds of wood used for inlaid centres of various articles of furniture. Amboyna is a yellowish wood of variegated shades, much used for inlaying. Satin wood also comes under the same head.—J. S.

Binding.—TYRO.—It is quite necessary to take out the old sewing in books to be rebound, and if you follow the instructions given in the articles you will be right. If you proceed in a proper manner, cutting the threads in the centre of each section, you will not damage your book. But if you rug and drive without cutting the threads, you will undoubtedly have torn leaves.—G. C.

Castings.—R. C. M. (*Bristol*).—Watch "Shop" for the answer to the above.

Dulcimer Making.—R. C. (*Tipton*).—You will find the article on "Dulcimer Making," in No. 31 of WORK, contains instructions for commencing to build that instrument.

Removing French Polish.—G. S. L. (*Hampstead*).—For flat surfaces, nothing better can be used than the steel scrapers as used by cabinet makers; for turned work use methylated spirits, though it can be nearly all got off by the application of strong hot soda water, to which has been added some oxalic acid; or, if a large quantity is required, use the following: ½ lb. American potash, ½ lb. soft soap, ½ lb. rock ammonia, 1 lb. washing soda, threepenny-worth of nitric acid, 1 gallon of water. Apply with a fibre or scrubbing brush, taking care of the hands. Swill off with plenty of clean water. When dry, oil and fill in; then repolish with clear polish to show up the natural grain.—LIFEBOAT.

Fretwork Patterns.—E. J. C. (*Kennington Park, S.E.*).—I advise you to search through Indexes to Vols. I. and II., not only to alight upon the information you are at present in search of, but also to gather several useful paragraphs relative to fretwork. Search the "Shop" columns more particularly for handy wrinkles.—J. S.

Battery Plates.—R. E. A. (*Portsea*).—The battery plates may be of any thickness from ¼ in. upward. The carbon plates may be ⅛ in. or ⅛ in. in thickness without any disadvantage other than taking up more solution space for the thicker plates. Very thin zinc plates are soon cut through by the acid, and very thin carbon plates are liable to breakage. Rolled zinc plates are preferable to those of cast zinc. The thickness of the plates did not interfere with the light from the lamp. The lamp did not light because either it alone, or its resistance, together with that of the connections, was too high for the current generated in the battery. The lamp must have a resistance not exceeding 8 ohms.—G. E. B.

Repairing Incandescent Lamp.—W. E. B. (*Birmingham*).—If the platinum loops are not broken off into the glass, you may make connection with them by soldering a scrap of No. 20 copper wire to each. You may even get at enough of the platinum wire to make a joint with the copper by carefully filing away a little of the glass around the end of the wire. Smoothly flatten one end of the copper wire to thin foil, and make of this a socket to fit the end of the platinum wire; then dip it in soldering fluid, and apply a bead of solder on the tip of a soldering iron.—G. E. B.

Aquarium and Aviary.—NOVICE.—The mahogany pillars you speak of would, in my humble opinion, be quite unsuitable for the purposes of your sketch. An article on a Wardian Case is in the hands of the Editor, and when published will give you sufficient instruction, with a little modification, to carry out your ideas.—C. M. W.

Fountain.—A READER.—A fountain worked by an electric motor can be obtained from The Maughan Patent Geyser Company, Queen Victoria Street, E.C. I believe it is a patented article, but I am not so sure of its efficiency. A description of a single self-acting fountain was given in WORK last year; this without ornamentation would suit your purpose. A great many readers of WORK have made this fountain successfully.—C. M. W.

Amber Mouthpieces for Pipes.—CONTRIBUTOR.—Amber mouthpieces can only be obtained at first cost from Austria, where the trade is chiefly in the hands of Jews, and is the speciality of a very limited area; no British house could compete with these makers. CONTRIBUTOR should consult a London directory for an importer's address. If he has access to the current and last volumes of a London periodical of limited circulation called *Tobacco*, he may there find information about the trade in question. Cut amber is costly; compressed or "moulded" amber less so, but how it is moulded is, we believe, kept a trade secret. The mouth-

pieces and trinkets made of it have, however, every property of amber, even to the electric one. "Parksine" (an imitation of amber) was the invention of a Birmingham man. It has not been largely taken up in this country, but has found more favour with the French. Another imitation, now being manufactured in the United States, is "Silleroid." This latter has the disadvantage of being so inflammable as to be almost explosive.—S. W.

Thermograph.—J. F. (*San Remo*).—J. F. has designed a thermograph on the following plan. A spirit thermometer is delicately balanced like the beam of a scale; it contains also a short column of mercury, which the expanding and contracting spirit displaces—by so doing shifting the centre of gravity, so that it oscillates. One end carries a style. In front of the style is a cylinder which revolves once in seven days. It is intended to make the style record by a curved line the varying temperature. At this point he is confronted by a difficulty. If the style is replaced by a pen, there will be introduced, by the constant loss of weight, an error; also there will be friction and other evils which he points out. His hope has been that, by electricity and a chemically-prepared paper, he might be able to produce what he desired. He has tried potassium iodide, but without success. Now, the fact is, that a variety of chemicals are acted upon by electricity, but, unfortunately, J. F. bars the way by one condition, which is fatal, as far as I know, to success—that is, the paper must be *dry*. In all the processes known to me, moisture is necessary for chemical reaction. I have stated this much, as some correspondent may be able to suggest a method that I have not tried. There is a plan, however, which, I think, will be better even than a chemically-prepared paper, and which will in no way detract from the elegance of the instrument (a sketch of which is supplied me). It is to employ a small induction coil. Let one terminal of the secondary be connected with the metal pillar carrying the balanced thermometer; from the central pivot on which it turns, carry a small rod or wire which shall have metallic connection with the metal style. The other end of the secondary wire must be connected to the metal drum carrying the ruled paper, which should be a fine, smooth paper like "foreign post." As the current flows a series of small holes will be punctured in the paper, which on being removed may be used with an ink-pad, like one of the letter multiplying methods in use. This is the most perfect plan that I can suggest; by it there is no change of weight to shift the point of gravity; nothing to produce friction. J. F. asks for an opinion on his design, and says his critic need not be afraid of hurting his feelings. So far from passing an adverse criticism on his instrument, I think it a capital idea, and with the addition I have suggested, I believe it will make a most efficient electro-thermograph.—O. B.

Charge for Battery.—J. H. (*Manchester*).—Without seeing the battery, and in the absence of its description, one cannot well tell you how to charge it "completely." So many different batteries are, and have been, used for gas-lighting apparatus as to render a reply to your question a mere guess. If the gas-lighter is a small cylinder with a long rod projecting from it, there may, or may not, be a battery. It may be worked by a small machine. Tell me how the battery is made, and I will tell you how to charge it.—G. E. B.

Electrotyping.—H. G. W. (*Bath*).—The best book I know of on the subject is Watt's "Electro-Deposition," third edition, price 9s.; Mr. McMillan's "Treatise on Electro-Metallurgy," price 10s. 6d., is also a good book on the subject. A cheaper manual is Urquhart's "Electrotyping," price 5s.—G. E. B.

Insulation for Coil.—H. G. W. (*Bath*).—If you suspect the coil to be imperfectly insulated, immerse the whole instrument in melted paraffin wax, and keep it there until bubbles have ceased to come off from the wire. Running the wire through the hot wax, and basting each layer with it as the wire is wound on, will also improve the insulation. The efficiency of the coil will depend largely on the perfection of the insulation.—G. E. B.

Coil for Vacuum Tubes.—W. H. (*Pollockshaws*).—A wooden bobbin measuring 4½ in. by 4 in., with a body 1½ in. in diameter, having a ¼ in. hole in it, is altogether unsuitable for the purpose of forming part of either a shocking coil or one to illuminate vacuum tubes. The ends of this bobbin may be sawn off, and bored to fit the tube of a coil, but a wooden tube would be altogether unsuitable. Make a tube of $\frac{1}{16}$ in. sheet ebonite, 4½ in. to 5 in. in length, and ¼ in. in diameter. Turn holes in the bobbin ends to fit this tube, and glue the ends of the tube into these. The tube may be made of strong thin paper, glued, and wrapped around a glass rod to the required thickness. When this is dry and hard, it may be slipped off from the rod and glued into the bobbin ends. The core, made of a bundle of No. 20 soft iron wires, will fit into this tube. Over the tube wind two layers of *silk-covered* No. 18 copper wire. Cotton-covered wire is not nearly so good. Over this primary coil of wire wrap two or three layers of tough thin paper, soaked in melted paraffin wax. See that the paper has no holes in it, and baste it well with the hot wax on the outside. *Fill up* the bobbin with No. 36 silk-covered copper wire, coated with hot paraffin wax, and wound on evenly throughout. If you use No. 32 you will not get such a long spark as that from No. 36. This coil may be worked with current from three or four pint bichromate cells, and will give a smarter shock than you will care to take across the hand whilst spanning the terminals of the secondary. If you care to use your No. 18 cotton-covered wire for the primary, and your No. 32 silk-covered wire for the secondary, you will only get a very mild shocking coil, but it will be useless for lighting up vacuum tubes.—G. E. B.

Bent Iron.—R. N. (*Grays*).—If you are anxious to commence, you may get some good designs and much information on the subject by joining the Home Arts and Industries Association, Royal Albert Hall, S.W. The annual subscription is very low. You may get materials of Clark and Hunt, 160, Shoreditch; they promised me some time ago they would keep it in stock. The tools required are few and inexpensive.—WORKER BEE.

Re-painting, etc., Blinds.—R. J. (*South Devon*).—The ordinary charge for re-painting, new tapes and cords, and re-fixing Venetian blinds is, in London, 4d. per foot superficial, but it should be worth more to paint the iron corrugated laths mentioned. R. J. has five large blinds, which at 4d. per foot would cost £3 1s. 2d. I should say the value of the work on iron laths would be at least 25 per cent. extra—£3 16s.—B. A. B.

Stencils and Brushes.—A BEGINNER.—A short paper on cutting stencils appeared in WORK, Vol. I. The best way of cutting is upon a piece of old plate-glass, flat upon table or bench. Use a sharp-pointed pocket-knife, and keep an oilstone handy to "rub up" edge of knife every few cuts. Next to the foregoing, the main thing required is practice. With reference to the "dabbing" or "brushing on" motions with stencil brush (Fig. 1), the former is most correct for all stencil work, and is the safest. In some cases the pattern will not look regular and one even tone if brushed on. Rubbing is often quickest for stencilling on a distempered ceiling-flat,

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

Stencils and Brushes.

and where we use thin distemper or flat paint, which is more of a stain than body; but care is always necessary to get clean work with brushing. Respecting stipplers and their use, I give you a cut of three herewith, Fig. 2 having reversible handle, and Fig. 3 bridge handle. They are used for distributing paint or vehicles in a perfectly regular manner, and for taking out paint-brush streaks. In use, the paint is first spread—a good coat—and then the work is at once stippled with the ends of bristles until a regular surface of a granular nature is obtained. See articles on "Plain and Decorative House Painting," Vol. I.—LONDON DECORATOR.

Plant-Forcing Case.—SOMERSET.—Full instructions for making a plant case warmed by artificial heat will be given in a future number of WORK, together with an efficient heat regulator.—C. M. W.

Water Spray.—WEEKLY READER.—In order to throw a spray of about 30 ft. of water from the tub in your garden you will need a strong force pump—a suction pump might readily be made in tin work—but I would not advise you to attempt a force pump unless you can work up solid metals; the better plan would be to use a long length of hose as a syphon direct into your cistern, and thus conduct the water to the points required; in a smaller spray, certainly, but quite as convenient.—C. M. W.

Incubator.—F. W. A. (*Peckham*).—If the water in your incubator is nearly boiling, you should have no difficulty in getting up the required heat in the egg drawer; there should be no brown paper in the bottom of tank; and the temperature should be taken at the line corresponding to *the top* of the eggs. If the temperature at this point is high enough you need not trouble about the heat an inch or two lower down.—C. M. W.

Split in Violin.—R. T. (*Galashiels*).—Carefully remove the belly with a knife which is not very sharp, lay it on a flat piece of board, and drive small tacks all round close to the edge of the belly; this done, take out a sufficient number of the tacks on one side to release the belly. The joint should then be sponged quite clean, and laid aside to dry. The edges should be covered with fresh glue, the belly replaced in its position on the board, and the tacks again driven in; then draw tightly across, from one tack to another, a piece of strong twine; you will thus be able to get the joint quite close.—B.

Cast of the Foot.—CRISPIN.—The mould, as well as the cast itself, will have to be made of plaster, and not, as Crispin supposes, of clay. He should invest twopence in Nos. 74 and 81 of WORK. In 74 (Vol. II., p. 349) he will find all about plaster and the way of using it; and in 81 (Vol. II., p. 578) are special directions for casting parts of the living human body. The way in which a foot may best be cast is there illustrated by a diagram.—M. M.

Cost of Electric Bells.—GLENIFFER.—The relative cost of fitting a six-roomed villa with electric bells, as compared with the old system of pull-bells, will depend upon the number of bells you may require. If you do not employ an indicator, you will have to put a bell to each room, and this will increase the cost. The total cost will be from £4 15s. to £5 for material. In a new house provision should be made for laying the wires in zinc tubing laid in the plaster. Best quality line wires are coated with rubber under the cotton, to resist the damp.—G. E. B.

Gramme Dynamo.—G. W. (*Bradford*).—It is not an unusual occurrence to find an amateur in trouble with a dynamo of his own construction. Some little point in detail is missed, and this ensures entire failure in the performance of the machine. It may be a slight fault in the insulation of the wires; a fault in winding or connecting the coils; a fault on or in the commutator; a wrong adjustment of the brushes, which are given too great or too little bend; or the machine is driven in the wrong direction. Probably either one or more of these faults exist in your machine. First, test the insulation of the wire by means of a battery and galvanometer. If this is all right, examine the connections—one may be loose. If these are right, try to run the machine as an electro-motor, with current from your other dynamo, adjusting the brushes until you get the machine to move at its best. It must now be run as a dynamo, in the opposite direction to that of its movement as a motor, and the brushes must be adjusted to meet the requirements of a dynamo.—G. E. B.

Roofs.—D. LE D. (*Ireland*).—In answer to your query as to whether shingle roofs are suitable for this country (Ireland), I should say no, bearing in mind that Ireland is always considered to have a humid atmosphere. I have never met with a case where they have been specified for new work, and the only experience I have had with them has been in repairing old roofs; and this, I think, you will find to be the general modern experience. The fact of their not being used much in modern building tends to show that they have not been found as good as other and cheaper methods of covering a roof. They are fixed in the same manner as slates or plain tiles, and are mostly made of oak.—E. D.

Patterns.—J. C. B. (*Great Ayton*).—I do not know of any other fire-proof solution. Nothing of the kind is used by founders. The patterns are simply varnished or painted, and put away in rooms removed from the workshops. As a rule, no fire is allowed in a pattern stores, and no naked candle, only lamps enclosed in lanterns.—J.

Spring.—T. B. (*Harwich*).—You go to work the right way, but perhaps the section at the bend is less than that in other parts, and this, together with the hole there, becomes a source of weakness. Then you must sacrifice some amount of elasticity to retain strength.—J.

Paint for Cart.—J. C. (*Belfast*).—To get a good and durable bright red for the wheels of your cart, it would be advisable (after well cleaning and preparing them) to paint them once with Venetian red pigment, and then finish with two coats of vermilion. In both cases it is best for such work, and where only small surfaces have to be covered, to mix the pigment with one-third japanners' gold size and two-thirds of turpentine until of working consistency. The Venetian red is sold ground in oil, and the vermilion in powder only. Strain the paint before using, and finish with two coats of pale carriage varnish. You will then get a durable job.—F. P.

Bicycle Steel Castings.—B. C. (*Nottingham*).—Malleable steel castings can be had of Forsythe and Millar, Broad Street, Bridgeton, Glasgow. Crucible steel castings of the St. George's Cycle Co., 298, Hampstead Road, London. Steel castings of Brown Brothers, 7, Great Eastern Street, London. Brown Brothers will send their catalogue, which has innumerable illustrations of steel stampings for cycles, both diamond and cross-frame safeties. These are quite good enough for the highest class machines.—A. S. P.

Enamel Tricycle.—J. C. (*Bedale*).—Any enamelling done at home must be put on with a brush, like paint. The tricycle should be well cleaned and smoothed down with emery-cloth or glass-paper. The process of applying the enamel should be done in a warm room, and the parts may be heated at the fire, when the enamel will flow more freely. Use the Club Hard-drying Black Enamel, and as it dries very quickly, put it on with a brush an inch broad, covering as much as possible with a brushful, and take care not to go over the same place twice. The above enamel can be had in 1s. bottles at any of the cycle shops. The above is the only method, except stoving or baking, and J. C. would have to send the machine to an enameller or provide a stoving plant, costing about £12.—A. S. P.

Broken Fork.—J. W. R. (*Westminster*).—Unless J. W. R. is a mechanic and acquainted with brazing, he had better give his machine into the hands of a repairer. If the fork is broken up at the crown, a new fork has got to be fitted the same curve and size as the other. It has got to be brazed on. If broken anywhere else in the length, it may be mended by fitting about three inches of a smaller-sized fork inside the broken one, the broken part being in the middle of the three-inch piece; the parts must be

well filed and fitted clean for brazing. A practical brazier could do this easily enough, but the job at home by a green hand would be a failure.—A. S. P.

Advice on Emigration.—D. A. T. (*No Address*).—You may do well in either Queensland or South Africa. The latter is more unsettled, and probably more rough, but wages are higher as a rule, and so are the expenses of living. I believe New Zealand has even a grander future than Australia in the near future; the conditions of existence will be easier. Do not wait for a job at your trade as wheelwright, but take the first that comes to hand that you can do, and look about you until you see an opportunity to work at your trade. Neither loaf about the towns longer than obliged, but get back into the country, and settle down in a good position on a main road; you may then soon get a little business of your own around you, which will increase in proportion to the rate at which people settle down in the district. For myself, I think I would prefer N.W. Canada, 150 or 200 miles N.W. of Winnipeg.—WORKER BEE.

French Clock Snail.—RICHARD III.—Before altering the snail of the clock, make sure the fault is there. See that your rack teeth are all straight, that none are longer than the others, and that none are thicker on the tops; next see that the pallet gathers up only one tooth at a time, then see that the rack arms are not loose; if this is all right, try round, and note which hours are wrong, and see if the rack falls too far or not far enough: if not enough, scrape or file the snail where the rack drops till it drops right; if it drops too far, take off the snail from hour wheel, or jumper wheel, and swell it out by hammering with a round-faced hammer, or you might stretch the point of the rack that rests on the snail till it drops fair at the hours where it used to be wrong. Then try round, and file the snail down at the hours where it does not drop sufficient. To make a new snail, mount a round piece of brass on your hour wheel, and put a pointed pin in the rack arm in place of the half-round or square one. Put the rack hook in the first tooth of rack, and hold tight with one hand while you turn the hour wheel, or jumper wheel, round, letting the pointed pin of rack rest on the piece of brass for new snail; now put rack hook in second tooth, and so on till you have the twelve circles on the new snail that is to be. Next put on the minute wheel, shake minute and hour wheel (if snail is on it), put on your minute hand, and see that the striking is let off at the twelve; turn the hand down to six, and hold it there tight while you let the rack drop the whole twelve teeth with the pin resting on the snail; press on it so as to leave a clear mark. Now turn the minute hand round an hour, and repeat the scratch till you have twelve radial lines, as well as twelve circles, on the snail (of course, if the snail is on a jumper wheel, you simply move one tooth of it and make your scratches). All you have to do now is to file out between two radial lines down to the first circle, take the next radial line and file down to the second circle, and so on till you have the twelve steps, then file the pin in rack tail half through, and your snail is done.—A. B. C.

Cleaning Telescope.—SCENERY.—There is no mystery in the matter. You may take the telescope to pieces and clean it. Use a soft cloth or chamois leather for the lenses, so as not to scratch the surface of the glass. The risk is lest, knowing nothing of the matter, you might fail to replace the lenses in their proper cells. To entirely avoid accident, you had better remove only one piece of tubing at one time, and clean only one lens at one time, replacing the lens exactly as you found it before you touch another.—E. A. F.

Diapason.—BRIXTON.—The pins for the long keys should be inserted near the centre; about five-ninths of the length of the key, measured from the front, would be about the usual position. The pins for the black keys should be about § in. behind those of the white keys. Any weighting that may be requisite can best be determined when the action is completely attached. As regards the length of the keys, that will be a question for you to determine, having regard to the position of your action. Any length that will work conveniently will suffice.—M. W.

Groined Arches. — M. W. (*Manchester*). — "Masonry and Stonecutting," by E. Dobson, price 2s. 6d., is as suitable a book as you can have; it is published by Crosby Lockwood & Co., but you can order it through any bookseller. There is an atlas of plates to it, which I think is included in the price named, but you must inquire about this. After procuring the book, if you examine any work in progress or completed, you will get a much better idea. There is also "Masonry and Stonecutting," by P. Nicholson, published at 28s., which I believe you might get second-hand from Batsford, 52, High Holborn, London, for perhaps 10s.; this is a larger book.—M.

Colour Mixing.—J. G. P. (*Crewe*).—First obtain a knowledge of the names of pigments, which you will find are not always synonymous with the colours. Dutch pink is yellow, verditer is blue, lake is not purple-blue always, but sometimes green, yellow, brown, etc., or you will find it as a pigment colour, with a chalk base, or body, for fugitive colours. Doubtless a colourman's catalogue will help you at first better than a learned treatise: as Heywood & Wilkinson, Battle Bridge, N., or Mr. Parsons, Long Acre, W. C. For books: "Painting and Painters' Materials," by C. L. Condit, E. and F. N. Spon, Charing Cross, London; or, "Artists' Manual of Pigments," by Standage, Crosby Lockwood & Co., Stationers' Hall Court. This last is a low-priced book, the first a costly one.—J. C. K.

Camera.—T. J. (*Sheffield*).—To give practical details for the construction of the apparatus you require would occupy too much space for these columns. It would be the better plan to borrow one of the pattern you most fancy, and copy it. Some scores of different kinds are now in the market, of varying degrees of effectiveness. The most simple are, as a rule, to be preferred, and less likely to get out of order. For smooth working and real effectiveness a quarter-plate, or 5 × 4 camera, enclosed in a case and with a good supply of light double dark slides, is as good as any. The back of this can be made to open and allow focussing, and the exposure made by a lever on the outside connected with an instantaneous shutter. The lens is a very important item, and should not be less than six inches in focus. Work with a large aperture, and give good depth of definition. The focussing, as well as the finder, must be arranged and worked from the outside of the case.—D.

Tables of Weights.—IRONMONGER.—Almost all engineers' "Pocket Books" contain these tables, so you have a wide choice. There is a book of "Engineers' Tables," price 1s., published by Messrs. E. and F. N. Spon, Strand, W.C., London, which might suit you. These weights are very easy to calculate, for a bar of iron 1 in. square and 1 yd. long weighs 10 lbs., and steel is 2 per cent. heavier.—F. C.

Blowpipe.—ROMEO.—Hydrogen can be burnt at the end of a brass tube, but this tube should not have any openings in it on the side, as in a Bunsen burner. You would have to make a large quantity of the gas, store it in a gas-bag or reservoir of some kind, and conduct it thence to the burner. I presume that you would make it by adding sulphuric or hydrochloric acid to zinc or iron, and the gas would not come off steadily enough or in sufficient volume to burn in the burner straight off. This flame would be hot enough to melt thick glass tubes, and thus there would be no need to make an oxy-hydrogen blowpipe. Your want of coal-gas prevents you making the hydrogen in a cheaper way; and considering the large amount of materials required to make sufficient gas, I think it will be cheaper for you to save up till you get the 6s. 6d., and then buy a French blast spirit-lamp, which I have found to work capitally. Hydrogen is explosive if any air be mixed with it; so collect a little in a test-tube, and, by applying a match to this, see that it is free from admixed air before conducting the gas to the reservoir.—F. B. C.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Pompeian Blue.—CYANOS will be obliged to any reader who will give him the recipe for making the old Pompeian blue colour.

Band-Sawing Machine.—BON ACCORD writes:—"Will some practical reader kindly give me sketch and particulars of a Band-Sawing Machine, and how to construct it, with a wooden frame, to be used mostly for wheel work, to be driven by power?"

Blast Gas Furnace. — A. B. (*Manchester*) writes:—"I shall feel obliged for any information as to make and price of Griffin's Patent Blast Gas Furnace."

Fretworker's Address.—F. G. B. (*Hull*) writes:—"Will anyone kindly tell me the address of Russell, designer of fretwork?"

"Desideratum" Fountain.—AMATEUR writes:—"Can any reader of WORK give particulars of a self-acting fountain called the 'Desideratum,' with sketch of same? also instructions for making it?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Ferrules for Fishing-Rods.—P. T. (*Kasan, Russia*) writes, in reply to TELESCOPIC (see page 812, Vol. II.):—"You can get ferrules for fishing-rods of any size, and in any quantity, from Messrs. S. Allcock & Co., Standard Works, Redditch. I suppose any other firm in the wholesale fishing-tackle trade can supply them, but I give the name of Messrs. Allcock & Co. because I *know* that they make the article wanted."

Plane Iron.—R. H. W. (*Lewisham*) writes, in answer to query from ONE IN DISTRESS (see page 522, Vol. II.):—"You might try the iron illustrated in *Carpenter and Builder* of June 27th; it has three broad grooves in it, and the inventor claims that it does not want grinding. This, if it is a practical invention, would be the cheaper; or a more expensive alternative, the machine sold by Melhuish or by Moseley for sharpening plane irons after the principle of a grindstone, with a stone that puts a finishing edge to the iron. It is turned with one hand, and has a rest affixed, which keeps the iron at the right angle for sharpening."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—CHICK; G. C. (*Hackney*); E. F. B. (*Liverpool*); H. B. (*Notts*); TURNER; H. N. (*Ipswich*); F. H. (*Streatham Hill*); E. E. S. (*Devon*); F. L. (*West Cowes*); IMPATIENT; A. R. (*Scorrier Saw Mills*); INCLINED PLANE; SEWING MACHINE; C. T. B. (*Chapel-en-le-frith*); T. F. (*Aberdeen*); PATENT BALL BEARING CASTOR CO. (*Leicester*); J. F. (*Boston*); P. H. (*Camberwell, S.E.*); W. C. G. (*South Norwood, S.E.*); E. M. C. (*New Humberstone*); G. A. B. (*Yorks*); H. McC. (*Kilmarnock*); T. T. (*Harlesden, N.W.*); PUZZLE; G. E. B. (*Lewisham*); G. P. (*Fulham*); TABLETOP; J. M. (*Kilmarnock*); A. T. (*East Greenwich, S.E.*); J. T. B. (*Warrington*); F. D. B. (*Stamford Hill*); E. E. D. C. (*Crewe*); A. M. (*Glasgow*); E. D. R. (*Staffordshire*); H. O. H. (*Bristol*); H. R. J. (*Canning Town*); T. J. J. (*Tottenham*); R. L. (*North Wales*); SUBSCRIBER; C. T. (*Boston*).

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